July 1952 Pages 237-288

The Journal of the SOCIETY OF DYERS AND COLOURISTS

Volume 68 Number 7

CONTENTS

THE SOCIETY OF DYERS AND COLOURISTS 237

PROCEEDINGS OF THE SOCIETY—

Use of Sulphamic Acid Derivatives in the Application of Oxidation Blacks (*C. Zuber and B. Jomain*) 241

The Continuous Dyeing of Vat Dyes (the Standfast Molten Metal Technique) (*J. Ardron, M. R. Fox, and R. W. Speke*) 249

CORRESPONDENCE 256

NOTES 258

NEW BOOKS AND PUBLICATIONS 261

MANUFACTURERS' PUBLICATIONS AND PATTERN CARDS . 263

ABSTRACTS 264

THE SOCIETY OF DYERS AND COLOURISTS 19 PICCADILLY BRADFORD YORKS

For all wet processing

TEEPOL or LENSEX

★ LIME SOAP DISPERSION

A good textile detergent must not only be free of any tendency to lime soap formation itself. It must also disperse lime soaps left on fibres or fabrics from previous processes. TEEPOL and LENSEX have exceptional powers of lime soap dispersion and their use in wet processing will bring, for example, brighter, more even dyeing; easier carding and spinning of woollens and worsteds, reducing "tear" and making possible the spinning of finer counts with less "ends down." From scour to finish, use TEEPOL or LENSEX for all wet processing.

SHELL

SHELL CHEMICALS LIMITED, Norman House, 105-109 Strand, W.C.2. *Tel:* Temple Bar 4455
(DISTRIBUTORS)

TL10

Divisional Offices: Walter House, Bedford St., London, W.C.2. *Tel:* Temple Bar 4455 • 41 Deansgate, Manchester, 3. *Tel:* Deansgate 6451
Claronde Chambers, 39 Corporation St., Birmingham, 2. *Tel:* Midland 6954 • 38 St. Enoch Square, Glasgow, C. 1. *Tel:* Glasgow Central 9561
53 Middle Abbey Street, Dublin. *Tel:* Dublin 45771

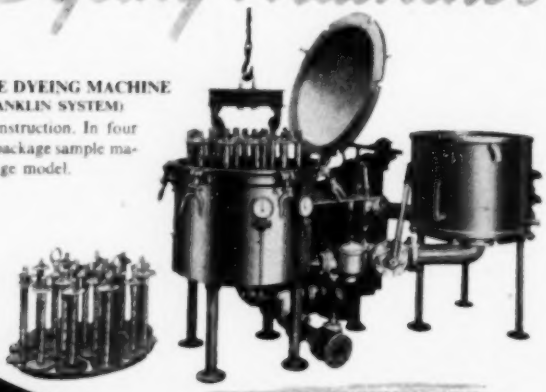
"TEEPOL" and "LENSEX" are Registered Trade Marks

PEGG
ESTABLISHED 1822

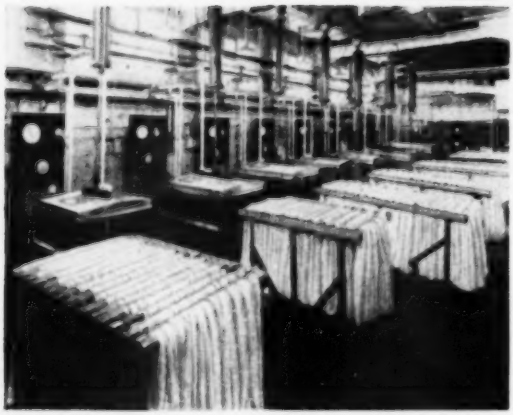
Dyeing Machines

The PEGG PACKAGE DYEING MACHINE
(FRANKLIN SYSTEM)

Stainless Steel Construction. In four sizes, from single package sample machine to 488 package model.



for Packages & Hanks...



The PEGG Pulsator
HANK DYEING MACHINE

Stainless Steel Construction. Dyes all classes of wool, worsted, mixture and linen yarns in hank form. Capacities from 50 to 1,500 lbs.

Builders of Dyeing Machines for Loose Stock, Hanks, Packages, Piece Goods, Fabric and Hose. Also Finishing Machines for all classes of Circular Knitted and Warp loom Fabrics and Garments. Pre-boarding and Finishing Machines for Nylon Hose.

SAMUEL PEGG & SON • BARKBY RD • LEICESTER • ENGLAND
A COMPANY OF THE MELLOR BROMLEY GROUP

xP17

Metachrome Brown 6G

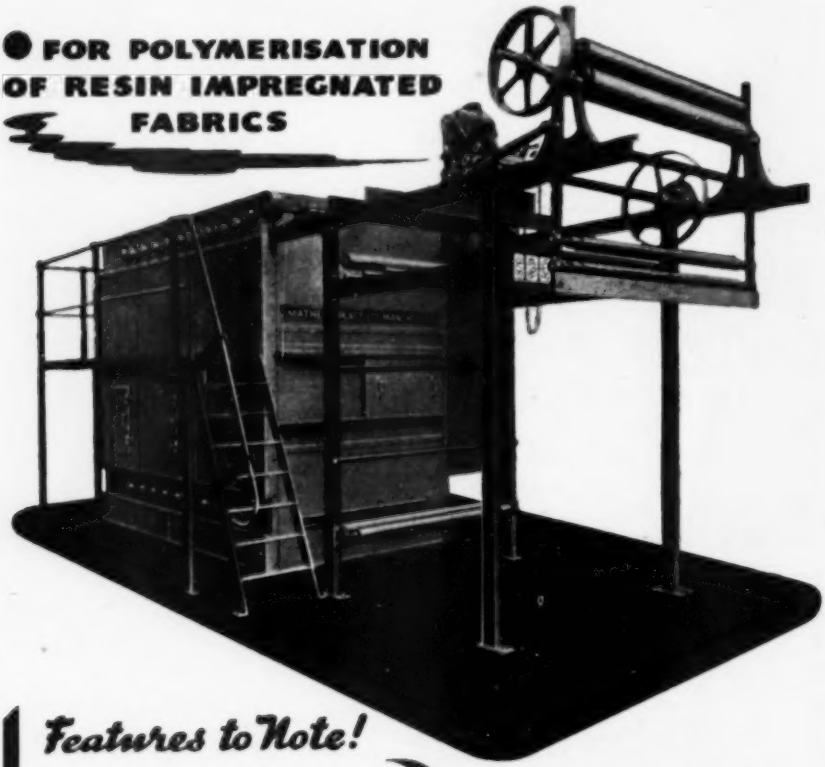
and

Metachrome Brown EB

Booklets, Samples and Technical assistance on application:-

BROTHERTON & COMPANY LTD
CITY CHAMBERS
Telephone: LEEDS 29321. ♦ LEEDS 1 ♦ Telegrams: BROTHERTON, LEEDS 1.

● FOR POLYMERISATION OF RESIN IMPREGNATED FABRICS



Features to Note!

- Exceptionally high production
- Adequate polymerisation with soft or firm handle as required
- Electrical, gas or steam heating elements as required
- Efficient and automatic temperature control — initial temperature quickly obtained
- Easy access with efficient insulation
- Compact and operative as a separate unit or part of a range
- Efficient air filtration
- Minimum length tension
- Versatile — water repellent and permanent glaze finish

THE MATHER & PLATT

BAKING STOVE

A FINE MACHINE...

Write now for details of the M & P Service to the Textile Trade

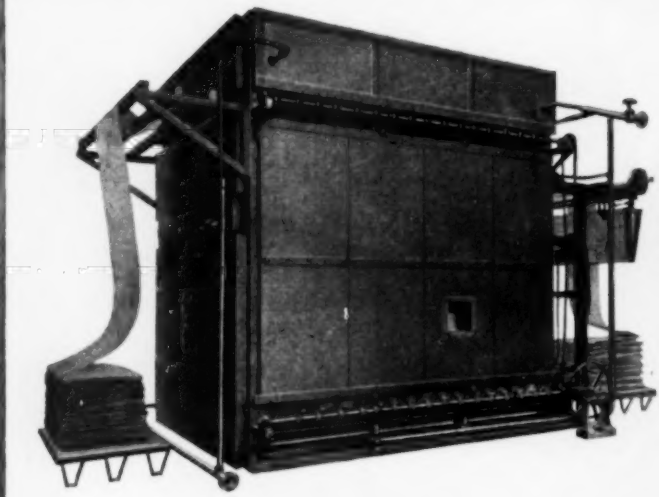
MATHER & PLATT LIMITED

PARK WORKS : MANCHESTER 10

Mystox
for MILDEWPROOFING
and ROTPROOFING
COTTON · JUTE · FLAX etc.
Mystolene
for SHOWERPROOFING
ALL TYPES OF CLOTH PARTICULARLY
CARBONISED AND STRONG ACID DYED
PIECES, FIBRO MIXTURES, etc.
CATOMANCE LTD. · WELWYN GARDEN CITY · HERTS

'BAKING' STOVE
for Polymerising

CREASE RESIST, WATER REPELLANT, PERMANENT GLAZE AND OTHER SYNTHETIC RESIN FINISHES



Made by **HUNT & MOSCROP LTD.**

APEX WORKS · MIDDLETON JUNCTION
MANCHESTER · ENGLAND

TELEGRAMS & CABLES 'CENTRAL MIDDLETON' LANCS.
TELEPHONE MIDDLETON 2476-7-8

DYEING CAN BE A "CHANCY" BUSINESS

As every dyer knows, bad dispersion of the dye can upset the most careful dyeing — preventing level shades and producing streaky colours. But by the simple process of adding Calgon (Sodium Metaphosphate) to the dye liquor, you can ensure that the dyes are properly dispersed. Calgon also eliminates the bad effect of any lime soap which may be on the fibre, and dyes sensitive to traces of lime salts can safely be used. Results become more certain and consistent, and colours clearer and brighter. Calgon is invaluable for use in the Cotton and Rayon industries as well as for Woollens and Silks. Write for a copy of "Calgon in the Textile Industry".

CALGON

for better dyeing

ALBRIGHT & WILSON LTD · *Water Treatment Department*
49 PARK LANE · LONDON · W.1 · *Telephone:* GROsvenor 1311 · *Works:* Oldbury & Widnes

SITUATIONS VACANT AND WANTED, Etc.

Replies may be addressed "Box —, Society of Dyers and Colourists," Dean House, 19 Piccadilly, Bradford, Yorks., where all communications relating to these Advertisements, which are treated in strict confidence, should be addressed.

SITUATIONS VACANT

COMMONWEALTH OF AUSTRALIA
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
APPOINTMENT No. 3780

APPLICATIONS are invited for appointment to a position of Research Officer (Shrinkproofing) in the Organisation's Wool Textile Research Laboratory, Belmont, Geelong, Victoria.

DUTIES—To carry out chemical research connected with the processing and modification of wool.

QUALIFICATIONS—University degree in science with honours, including research experience, or equivalent qualifications.

SALARY—Within the range of Research Officer, £A800 to £A1208 p.a. (actual), thirteen increments.

Salary includes a cost-of-living adjustment of £A144 p.a. Fare to Australia (including those of wife and family) will be paid. Appointee may be granted Superannuation privileges.

Applications, referring to appointment No. 3780, and stating full name, place and date of birth, nationality, marital state, present employment, particulars of qualifications and experience, and of war service, if any, accompanied by names and addresses of at least two persons willing to act as referees, if so desired, and copies of not more than four testimonials, should reach the undersigned (from whom further particulars may be obtained) by the 15th August 1952.

J. E. CUMMINS (Chief Scientific Liaison Officer), Australian Scientific Liaison Office, Africa House, Kingsway, London W.C.2.

APPLICATIONS are invited from young Honours Graduates in Chemistry for an appointment in the Research Department of Tootal Broadhurst Lee Co. Ltd. Research experience though desirable is not essential, nor is experience in the textile industry. The Company is a vertical organisation and is interested in all textile fibres. Salary will be according to qualifications and experience. Applications should be made in writing to the Personnel Manager, 58 Oxford Street, Manchester, 1.

TOOTAL BROADHURST LEE CO. LTD. have a vacancy in their Research Department for a young Honours Graduate in Physics. The work involves research for new products and new processes in connection with all textile fibres. Salary according to qualifications and experience. Applications should be made in writing to the Personnel Manager, 58 Oxford Street, Manchester 1.

DYEHOUSE MANAGER required to take full charge at large Felt Hat Factory, Manchester area. Must have had practical experience. Excellent opportunity to right man. State age and experience. Box V570

FOR INDIA. Chemists wanted for Cotton and Woollen Mills in South India, under British Management. Minimum qualification University degree or equivalent.

Good salaries on a rising scale are offered according to age and capabilities of applicants. In addition to salary a substantial "cost of living" allowance is paid monthly.

Other amenities are—free furnished quarters, free medical attention, provident fund, superannuation fund, home leave with free passages for the officers and their wives. First contract for three years.

Apply, stating age, qualifications, whether married or single, and giving details of any family, to Binny & Co. Ltd., 122 Leadenhall Street, London E.C.3.

TEXTILE CHEMIST or Technologist, under 25, wanted for testing and development work in London textile laboratory of well known firm. Must be good disciplinarian. Salary according to qualifications. Apply in writing to Box V576.

SAN SALVADOR Company requires Superintendent to take charge of small printing and dyeing plant in that country. Candidate should be practical man with some knowledge of chemistry, capable of teaching printing and familiar with the practical aspects of bleaching, dyeing, and finishing. The salary offered is the equivalent of £2000 per annum paid in dollars. House available and transport paid by employer. Please reply with full details to Box V577.

TEXTILE CHEMIST with Works experience, in processing of animal, vegetable and artificial fibres and piece goods, required by a progressive firm of textile chemical manufacturers in the Home Counties. Please state in confidence age, experience and salary required. Box V579

TECHNICAL SERVICE REPRESENTATIVE required by British Industrial Plastics Ltd in connection with the use of amino-resins on textiles. Previous experience of resin treatment not essential but must have had practical experience of the finishing of rayon, cotton and wool, together with some chemical training. Post will be based in Manchester and carries Pension and Dependants' Scheme. Salary will depend on age (25 to 30), qualifications and experience. This vacancy has been notified to the Regional Appointments Office in Manchester through whom applications should be made.

SITUATIONS WANTED

SITUATION REQUIRED as Dyer or Assistant by A.T.I., City and Guilds, age 25, two years' experience Dyer's Assistant and Laboratory Assistant in loose wool and slubbing. Box W578

COURTAULDS' SCIENTIFIC AND EDUCATIONAL TRUST FUND

Entrance Scholarships in Textile Technology

A limited number of Entrance Scholarships, for which funds have been provided by the Courtaulds' Scientific and Educational Trust, tenable at the University of Leeds, or at the Manchester College of Technology (University of Manchester), are open to students wishing to pursue studies in any branch of textile technology.

The value of the Scholarships will be £50 per annum for three years.

There are two classes of award—

(*a*) Scholarships which are recognised by the Ministry of Education as a qualification under their regulations for State Scholarships. Awards will be made by the respective Universities in September 1952 on the results of the examination for the General Certificate of Education.

(*b*) Scholarships which may be awarded by the respective Universities to candidates who do not qualify for an award under (*a*) above, but who are considered to be of sufficient merit by virtue of attainments other than the General Certificate of Education. These Scholarships will not qualify the holders for State Scholarships from the Ministry of Education, but will be tenable concurrently with other scholarships.

Candidates should submit their applications to the Registrar of the University of Leeds or the Manchester College of Technology, not later than the 31st July 1952, giving full particulars of their qualifications.

DYESTUFFS · ULTRAMARINES

DURA BEAU HOSIERY FINISHES

TEXTILE AUXILIARY PRODUCTS AND FINISHES

T. SAVILLE WHITTLE LTD
QUEEN'S CHAMBERS
49 PRINCESS STREET
MANCHESTER 2

Telephone Central 8667 (two lines) Telegrams SENILINA MANCHESTER

IMPERIAL CHEMICAL INDUSTRIES LIMITED

YEAR OF OUTSTANDING PROGRESS

The 25th annual general meeting of Imperial Chemical Industries Ltd. was held on June 19th at Wigmore Hall, 36 Wigmore Street, London W.1.

Mr. J. Rogers, O.B.E., LL.D., the chairman, presided and in the course of his speech said—

"As the report shows, the company has again broken records, both in turnover and in profits. It is true that some part of the increase in turnover is due to rising prices, but the physical volume of turnover has also increased to record levels.

It is the considered opinion of the directors, that after full provision has been made for the proper maintenance of the productive assets of the company, stockholders should be given, by way of increased dividends, some part of the increased profits due to the progressive expansion of the company. The total Ordinary dividend for 1951, 13 per cent., before taxation, is still smaller in purchasing power than the dividend of 8 per cent. paid for a number of years before and during the war.

RECORD OF PROGRESS

The company's record for 1951 is one of outstanding progress. That progress continues, and the directors have before them no shortage of important and profitable schemes of expansion and development in which the company's resources can be employed.

Exports are as important, or almost as important, as rearmament. The company's direct exports are now running at well over a million pounds a week. In addition to the company's direct exports, it has to be remembered that a substantial proportion of our products goes to other industries which are producing for export. For this reason it is in the interests of the country, as well as of the company that our capital programme should be pressed forward with no more delay than is absolutely necessary during the present crisis conditions.

So far in 1952 we have not been seriously affected by the conditions and our turnover has been satisfactory, notwithstanding the resurgence of German and Japanese competition.

I am confident that we shall continue to expand our business in spite of the obstacles to expansion placed in our way, and in the way of other progressive companies, in the form of penal taxation, which seems almost to have been designed to encourage stagnation and to prevent progress. I refer, in particular, to the new excess profits levy."

The report was adopted.

Review of Textile Progress

Volume 2

Compiled and published jointly by the Textile Institute
and the Society of Dyers and Colourists

Editors

W J HALL
A.R.C.S B.Sc.

C J W HOOPER
Ph.D D.I.C A.R.C.S

The Textile Institute and the Society of Dyers and Colourists have jointly published a Review of Textile Progress, Volume 2 relating particularly to the year 1950. There are 25 contributors in the Review and the authors are experts in the various sections for which they are responsible

£1 5s 0d

(A few copies of Vol. 1, the 1949 issue, are still available, price £1 0s 0d)

Post free from

THE TEXTILE INSTITUTE 10 BLACKFRIARS STREET MANCHESTER 3

Telephone BLAckfriars 1457/8

The Journal of the Society of Dyers and Colourists

(Subscription rates for non-members £4 per annum, post free)
(Abstracts section only printed on one side of paper—£1 10s 0d per annum)

NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1–6 of the January 1952 and pages 237–240 of the July 1952 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, 19 Piccadilly, Bradford, Yorkshire (*Telephone* Bradford 25138–9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

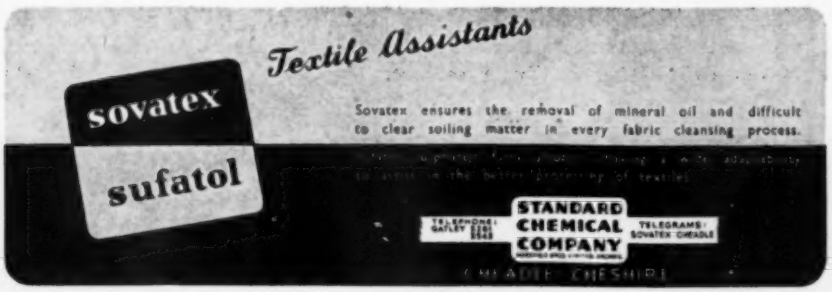
LECTURES

The Reduction Properties of Vat Dyes
W. J. Marshall and R. H. Peters

Recent Developments in Bleaching with Hydrogen Peroxide
W. S. Wood and K. W. Richmond

COMMUNICATION

The Reaction between Wool and Nickelammonium Hydroxide
I—The Adsorption of Nickel by Wool from Solutions of Nickelammonium Hydroxide
J. W. Bell and C. S. Whewell


Textile Assistants
sovatex
sufatol
Sovatex ensures the removal of mineral oil and difficult to clear soiling matter in every fabric cleansing process.
STANDARD CHEMICAL COMPANY
TELEGRAMS: SOVATEX CHEADLE
CHEADLE CHESHIRE

CAPRICORNUS *(the Goat)*

Capricornus,
the Goat is a constellation in
the Pegasus region whose Great
Square almost rivals the Great
Bear as a feature of the night sky.
The day-to-day activities of the
Dyer bring him into contact with
many colour problems, but he is
quick to appreciate the un-
rivalled qualities of Sandoz dye-
stuffs in solving many of these
difficulties.

A Recent Introduction:
SOLAR BROWN
RLN

Sandoz PRODUCTS LTD.

COLOUR FOR NYLON

Nylon materials for making up into children's frocks must have colours that are reasonably fast to washing. The dyestuffs to use are:

For filament nylon:

Dispersol

Duranol

Multamine

For spun nylon:

Solacet

Acid

There is an I.C.I. dyestuff for every type of nylon material

For full information please apply to:

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

ICI

D.220

THE JOURNAL
OF THE
Society of Dyers and Colourists

Volume 68—Number 7 JULY 1952 *Issued Monthly*

THE SOCIETY OF DYERS AND COLOURISTS

PAST PRESIDENTS

1884–1886 *Henry Ripley, J.P.
1886–1888 *F. H. Bowman, D.Sc., F.I.C., F.R.S.E.
1888–1890 *Jas. Sharp
1890–1891 *J. R. Armitage, J.P.
1891–1893 *Henry Sutcliffe, J.P.
1893–1895 *Robt. Holliday
1895–1897 *Jer. Whitaker
1897–1899 *J. B. Moorhouse, J.P.
1899–1901 *H. Grandage
1901–1903 *C. Dreyfus, Ph.D.
1903–1905 *C. R. Hindley, J.P.
1905–1907 *Sir Thomas Wardle, J.P.
1907 *Sir William Henry Perkin, LL.D., Ph.D., D.Sc., F.R.S.
1907–1910 *Prof. Raphael Meldola, F.I.C., F.R.S.
1910–1912 *The Right Hon. Lord Cawley of Prestwich
1912–1914 *George Douglas
1914–1916 *Rufus D. Pullar, J.P.
1916–1918 *Alfred Ree, Ph.D.
1918–1920 *Charles F. Cross, F.R.S.
1920–1921 *The Right Hon. Lord Moulton, P.C., K.C.B., G.B.E., F.R.S.
1921–1923 *Sir H. Sutcliffe Smith
1923–1925 S. J. Pentecost
1925–1927 *Ernest Hickson
1927–1929 H. Levinstein, M.Sc., Ph.D., F.R.I.C.
1929–1931 Cyril Eastman
1931–1933 Lennox B. Lee
1933–1934 *Thorp Whitaker, O.B.E.
1934–1936 *Arthur G. Green, M.Sc., F.I.C., F.R.S.
1936–1937 *Gerald T. Moody, D.Sc.
1937–1939 *Frederick F. Flinn, J.P.
1939–1946 C. J. T. Cronshaw, D.Sc., F.R.I.C., M.I.Chem.E., F.T.I., F.R.S.E.
1946–1948 C. M. Whittaker, D.Sc., F.T.I.
1948–1950 G. E. Holden, C.B.E., M.Sc., F.R.I.C.
1950–1952 F. Scholefield, M.Sc., F.R.I.C., F.T.I.

THE COUNCIL OF THE SOCIETY

President
H. H. Bowen

Immediate Past President
F. Scholefield, M.Sc., F.R.I.C., F.T.I.

Vice-presidents
G. B. Angus, B.Sc., A.R.I.C., A.M.I.I.A.
C. O. Clark, F.T.I.
W. A. Edwards, F.T.I.
F. Farrington, B.Sc., F.R.I.C.
H. Foster
F. L. Goodall, M.Sc., F.R.I.C.
J. M. Goodall
R. J. Hannay, B.Sc., F.R.I.C.
J. M. Preston, B.Sc., F.R.I.C., F.T.I.
Prof. J. B. Speakman, D.Sc., F.R.I.C., F.T.I.
H. A. Thomas, Ph.D., F.R.I.C., F.T.I.
G. M. Williams, B.Sc.Tech., A.M.C.T.

Ordinary Members
J. Boulton, M.Sc.Tech., F.R.I.C., F.T.I.
Prof. W. Bradley, D.Sc., Ph.D., F.R.I.C.
A. Breare, M.Sc., F.R.I.C.
G. T. Douglas, B.Sc., Ph.D.
R. L. Elliott, Ph.D., F.R.I.C.
D. Hanson, B.Sc., F.R.I.C.
F. Jordinson, M.Sc., F.R.I.C.
H. C. Olpin, M.Sc., F.R.I.C.
C. B. Stevens, Ph.D.
A. Thomson, A.R.I.C.
H. A. Turner, M.Sc., F.R.I.C., F.T.I.
T. Vickerstaff, Ph.D., A.R.I.C.

SECTION OFFICERS

Chairmen
R. D. Alexander
D. A. Derrett-Smith, B.Sc., F.R.I.C., F.T.I.
F. Farrington, B.Sc., F.R.I.C.
A. P. Kershaw
S. L. Peel, B.Sc.
E. Rolfe, B.Sc.
G. F. Wood

Honorary Secretaries
F. Atack
A. W. Carpenter
H. W. Ellis, Ph.D., A.R.C.S., A.R.I.C.
A. S. Fern, B.Sc., D.I.C.
J. Porter
G. E. Styan, B.Sc., A.R.I.C.
H. Turner

Honorary Treasurer
H. Jennison, A.M.C.T., A.R.I.C.
Kirkwood, Bradford Road, Tranmere Park, Guiseley, near Leeds

Honorary Secretary
J. Barritt, B.Sc., A.R.C.S., A.R.I.C.
12 Laurel Bank Court, Headingley, Leeds 6

Chairman of Publications Committee
C. L. Bird, M.Sc., F.R.I.C.

Honorary Patent Agent
L. E. Jones, M.Sc., F.R.I.C., C.P.A.
Cooper's Buildings, Church Street, Liverpool

Honorary Solicitors
John Conchar & Co.
34 Piccadilly, Bradford

Editor and General Secretary
C. J. W. Hooper, Ph.D., D.I.C., A.R.C.S.

Assistant Secretary
E. Illingworth

Offices of the Society
Dean House, 19 Piccadilly, Bradford, Yorks.
(*Telephone* Bradford 25138-9)

*Deceased

COMMITTEES

(The President, Honorary Treasurer, and Honorary Secretary are *ex-officio* Members of all Committees and Subcommittees)

‡ Convener † Chairman ‡ Vice-chairman

FINANCE

C. L. Bird, M.Sc., F.R.I.C.
R. L. Elliott, Ph.D., F.R.I.C.
R. J. Hannay, B.Sc., F.R.I.C.
†H. Jennison, A.M.C.T., A.R.I.C.
A. Thomson, A.R.I.C.
G. M. Williams, B.Sc.Tech., A.M.C.T.

PUBLICATIONS

J. Barritt, B.Sc., A.R.C.S., A.R.I.C.
†C. L. Bird, M.Sc., F.R.I.C.
H. Blackshaw
G. G. Bradshaw, M.Sc., A.R.I.C.
P. W. Carlene, Ph.D., F.R.I.C.
C. O. Clark, F.T.I.
P. W. Cunliffe, Ph.D., F.R.I.C., F.T.I.
A. W. Doyle, M.Sc.Tech., A.R.I.C., A.T.I.
C. H. Giles, Ph.D., F.R.I.C.
R. Grice
J. R. Hannay, F.R.I.C.
H. H. Hodgson, M.A., Ph.D., F.R.I.C.
L. L. Lloyd, Ph.D., F.R.I.C.
J. M. Preston, B.Sc., F.R.I.C., F.T.I.
G. E. Styan, B.Sc., A.R.I.C.
A. Thomson, A.R.I.C.
H. A. Turner, M.Sc., F.R.I.C., F.T.I.
J. A. Wallwork, A.R.I.C.
E. Waters, B.Sc.
C. S. Whewell, Ph.D., F.R.I.C., F.T.I.

Honorary Secretary— J. V. SUMMERSGILL, B.Sc.
The Geigy Co. Ltd., 4 Vincent Street, Bradford

ABSTRACTORS

A. Barlow (Miss), M.Sc.
J. W. Bell, Ph.D., A.R.I.C.
W. G. Cameron, Ph.D.
E. Chadwick, M.Sc.Tech., A.R.I.C.
C. O. Clark, F.T.I.
J. W. Duarte, B.Sc., A.R.I.C.
F. F. Elsworth, Ph.D., A.R.I.C.
A. S. Fern, B.Sc., D.I.C.
R. K. Fourness, B.Sc., A.R.I.C.
H. H. Hodgson, M.A., Ph.D., F.R.I.C.
A. Howarth, A.M.C.T., A.T.I.
A. Johnson, M.Sc.Tech.
H. Kennedy
G. E. Key, F.T.I.
B. Kramrisch, A.R.I.C., F.T.I.
G. Lewis, B.Sc.
W. J. Marshall, B.Sc., M.R.I., A.R.I.C.
L. Peters, M.Sc., Ph.D.
C.H. Reece, Ph.D., A.R.I.C.
W. K. Rhodes, A.R.I.C.
S. V. Sergeant, B.Sc., A.R.I.C.
E. Stead, M.Sc.
C. B. Stevens, Ph.D.
H. I. Stonehill, Ph.D., D.I.C., F.R.I.C.
A. E. Stubbs, M.Sc., Ph.D. F.R.I.C.
W. Taussig, F.T.I.

COLOUR INDEX EDITORIAL PANEL

†J. Barritt, B.Sc., A.R.C.S., A.R.I.C.
‡H. Blackshaw
Prof. W. Bradley, D.Sc., Ph.D., F.R.I.C.
C. O. Clark, F.T.I.
J. G. Grundy
R. J. Hannay, B.Sc., F.R.I.C.
F. S. H. Head, Ph.D.
H. H. Hodgson, M.A., Ph.D., F.R.I.C.
M. Lapworth, B.Sc., A.R.C.S., A.R.I.C.
A. Thomson, A.R.I.C.

CHARTER

C. J. T. Cronshaw, D.Sc., F.R.I.C., M.I.Chem.E., F.T.I., F.R.S.E.
F. Scholefield, M.Sc., F.R.I.C., F.T.I.
F. Smith
Prof. J. B. Speakman, D.Sc., F.R.I.C., F.T.I.
C. M. Whittaker, D.Sc., F.T.I.

DIPLOMA

J. Boulton, M.Sc.Tech., F.R.I.C., F.T.I.
C. O. Clark, F.T.I.
A. J. Crockatt, M.Sc., F.R.I.C.
W. A. Edwards, F.T.I.
R. L. Elliott, Ph.D., F.R.I.C.
F. Farrington, B.Sc., F.R.I.C.
C. H. Giles, Ph.D., F.R.I.C.
F. L. Goodall, M.Sc., F.R.I.C.
N. Hamer, A.M.C.T.
R. J. Hannay, B.Sc., F.R.I.C.
H. C. Olpin, M.Sc., F.R.I.C.
W. Penn, F.T.I.
H. Richardson, M.Sc., F.Inst.P.
F. Scholefield, M.Sc., F.R.I.C., F.T.I.
F. Smith
Prof. J. B. Speakman, D.Sc., F.R.I.C., F.T.I.
C. B. Stevens, Ph.D.
J. V. Summersgill, B.Sc.
H. A. Turner, M.Sc., F.R.I.C., F.T.I.
A. G. Tyler, M.Sc., A.R.I.C., A.T.I.
G. S. J. White, B.A., F.T.I.
C. C. Wilcock, A.R.T.C. (Salford), F.T.I.

THE WORSHIPFUL COMPANY OF DYERS RESEARCH MEDAL

J. Boulton, M.Sc.Tech., F.R.I.C., F.T.I.
Prof. W. Bradley, D.Sc., Ph.D., F.R.I.C.
P. W. Cunliffe, Ph.D., F.R.I.C., F.T.I.
T. A. Forster, Ph.D., A.R.I.C.
H. H. Hodgson, M.A., Ph.D., F.R.I.C.
G. E. Holden, C.B.E., M.Sc., F.R.I.C. (representing the Company)
G. S. J. White, B.A., F.T.I.

THE SOCIETY OF DYERS AND COLOURISTS MEDALS

H. à Brassard
W. A. Edwards, F.T.I.
F. L. Goodall, M.Sc., F.R.I.C.
G. E. Holden, C.B.E., M.Sc., F.R.I.C.
G. G. Hopkinson, A.R.I.C.
F. Smith
C. M. Whittaker, D.Sc., F.T.I.
G. M. Williams, B.Sc.Tech., A.M.C.T.

THE WORSHIPFUL COMPANY OF FELTMAKERS RESEARCH MEDAL

T. Barr, Ph.D., F.R.I.C.
Joseph Begley, F.I.L.
A. B. D. Cassie, M.A., Ph.D., D.Sc., F.Inst.P.
G. W. Gunter
W. S. Shaw, D.Sc., Ph.D., F.R.I.C., F.T.I.
§Prof. J. B. Speakman, D.Sc., F.R.I.C., F.T.I.

GEORGE DOUGLAS LECTURE

The President, The Immediate Past President or President-elect, The Chairman of the Publications Committee, A Representative of the Bradford Dyers' Association Ltd. (J. G. Evans, M.Sc.Tech.)

MERCER LECTURE

Prof. W. Bradley, D.Sc., Ph.D., F.R.I.C.
†T. A. Forster, Ph.D., A.R.I.C.
R. J. Hannay, B.Sc., F.R.I.C.
J. T. Marsh, M.Sc., F.R.I.C., F.T.I.
F. Scholefield, M.Sc., F.R.I.C., F.T.I.
J. V. Summersgill, B.Sc.
G. S. J. White, B.A., F.T.I.
C. C. Wilcock, A.R.T.C. (Salford), F.T.I.
Chairman of the Publications Committee

FASTNESS TESTS

Co-ordinating Committee

G. B. Angus, B.Sc., A.R.I.C., A.M.I.I.A.
J. Boulton, M.Sc.Tech., F.R.I.C., F.T.I.
G. G. Bradshaw, M.Sc., A.R.I.C.
†P. W. Cunliffe, Ph.D., F.R.I.C., F.T.I.
J. G. Grundy
R. J. Hannay, B.Sc., F.R.I.C.
J. V. Summersgill, B.Sc.
G. S. J. White, B.A., F.T.I.
E. Wilson, B.A.

Honorary Secretary— K. McLAREN, B.Sc., A.R.I.C.
I.C.I. Ltd., Dyestuffs Division, Hexagon House, Blackley, Manchester 9

Subcommittees

	Chairman	*Honorary Secretary*
Alkaline Milling ...	E. Wilson	J. V. Summersgill
Bleaching ...	M. E. Probert	F. W. Bradley
Burnt Gas Fumes	E. Wilson	G. T. Douglas
Light	J. Boulton	K. McLaren
Perspiration ...	E. Wilson	G. G. Bradshaw
Washing	J. G. Grundy (*Convener*)	

DYEING AFFINITY OF REGENERATED CELLULOSE

†J. Boulton, M.Sc.Tech., F.R.I.C., F.T.I.
P. W. Cunliffe, Ph.D., F.R.I.C., F.T.I.
R. H. Peters, Ph.D., A.R.I.C.
J. M. Preston, B.Sc., F.R.I.C., F.T.I.
T. Vickerstaff, Ph.D., A.R.I.C.

Honorary Secretary— W. ARMFIELD, A.M.C.T., F.T.I.
Courtaulds Ltd., Campbell Street, Droylsden Manchester

PRESERVATION OF HISTORICAL RECORDS

F. Crompton
H. H. Hodgson, M.A., Ph.D., F.R.I.C.
K. G. Ponting
J. W. Reidy, M.A.(Com.), F.R.I.C., A.T.I.
W. S. Stansfield, F.T.I.
W. P. Walker
†C. M. Whittaker, D.Sc., F.T.I.

Honorary Secretary—C. O. CLARK, F.T.I.
Bradford Dyers Association Ltd., 39 Well Street, Bradford

TERMS AND DEFINITIONS COMMITTEE

H. à Brassard
C. O. Clark, F.T.I.
S. R. Cockett, M.Sc., F.R.I.C., A.M.C.T.
N. Hamer, A.M.C.T.
W. Kershaw, F.T.I.
L. L. Lloyd, Ph.D., F.R.I.C.
F. Smith
H. A. Turner, M.Sc., F.R.I.C., F.T.I.
†T. Vickerstaff, Ph.D., A.R.I.C.
J. A. Wallwork, A.R.I.C.

Honorary Secretary— H. C. OLPIN, M.Sc., F.R.I.C.
24 Kedleston Road, Allestree, Derby

PERKIN CENTENARY

Prof. W. Bradley, D.Sc., Ph.D., F.R.I.C.
H. Jackson
F. Scholefield, M.Sc., F.R.I.C., F.T.I.
C. M. Whittaker, D.Sc., F.T.I.

JOINT COMMITTEES WITH THE TEXTILE INSTITUTE (SOCIETY REPRESENTATIVES)

STANDING COMMITTEE

C. L. Bird, M.Sc., F.R.I.C.
R. J. Hannay, B.Sc., F.R.I.C.
F. Scholefield, M.Sc., F.R.I.C., F.T.I.
F. Smith
H. A. Thomas, Ph.D., F.R.I.C., F.T.I.

REVIEWS OF TEXTILE PROGRESS

P. W. Carlene, Ph.D., F.R.I.C.
H. A. Turner, M.Sc., F.R.I.C., F.T.I.
C. S. Whewell, Ph.D., F.R.I.C., F.T.I.
†G. S. J. White, B.A., F.T.I.
G. M. Williams, B.Sc.Tech., A.M.C.T.

MOTH AND DERMESTID BEETLE PROOFING

J. Barritt, B.Sc., A.R.C.S., A.R.I.C.
R. Burgess, M.Sc., Ph.D.
†R. J. Hannay, B.Sc., F.R.I.C.
G. V. B. Herford, O.B.E., M.Sc., B.A.
E. B. Higgins, Ph.D.
C. S. Whewell, Ph.D., F.R.I.C., F.T.I.

REPRESENTATIVES ON EXTERNAL BODIES

BRITISH BIOLOGICAL STAINS COMMISSION
Prof. W. Bradley, D.Sc., Ph.D., F.R.I.C.

BRITISH STANDARDS INSTITUTION—
COTTON INDUSTRY COMMITTEE
J. M. Preston, B.Sc., F.R.I.C., F.T.I.

LINEN INDUSTRY COMMITTEE *J. A. Young*

RAYON INDUSTRY COMMITTEE
H. A. Thomas, Ph.D., F.R.I.C., F.T.I.

WOOL INDUSTRY COMMITTEE
J. Barritt, B.Sc., A.R.C.S., A.R.I.C.

ROTPROOFING OF TEXTILES OTHER THAN CLOTHING
E. Race, Ph.D., F.R.I.C.

SILK INDUSTRY COMMITTEE *Vacant*

TEXTILE DIVISIONAL COUNCIL
J. Boulton, M.Sc.Tech., F.R.I.C., F.T.I.

SUBCOMMITTEE AND PANEL ON STANDARDS FOR ANODIC OXIDATION FINISHES FOR ALUMINIUM AND ALUMINIUM ALLOYS J. M. Hay

UNIVERSAL DECIMAL CLASSIFICATION COMMITTEE—
TEXTILES PANEL *The Editor*

CHEMICAL SYMBOLS AND ABBREVIATIONS *The Editor*

RUBBER PROOFED CLOTHING STANDARDS COMMITTEE
R. J. Hannay, B.Sc., F.R.I.C.

COLOUR TERMINOLOGY
H. W. Ellis, Ph.D., A.R.C.S., A.R.I.C.

STEERING COMMITTEE T/–/8
P. W. Cunliffe, Ph.D., F.R.I.C., F.T.I.

BUREAU OF ABSTRACTS INDEXING COMMITTEE *The Editor*

CHEMICAL SOCIETY LIBRARY COMMITTEE
T. H. Morton, M.Sc., Ph.D.

CITY AND GUILDS OF LONDON INSTITUTE DYEING ADVISORY COMMITTEE R. L. Elliott, Ph.D., F.R.I.C.

PARLIAMENTARY AND SCIENTIFIC COMMITTEE
H. W. Ellis, Ph.D., A.R.C.S., A.R.I.C.

PHYSICAL SOCIETY COLOUR GROUP
T. Vickerstaff, Ph.D., A.R.I.C.

REGIONAL ADVISORY COUNCIL FOR TECHNICAL AND OTHER FORMS OF FURTHER EDUCATION FOR MANCHESTER AND DISTRICT
T. Vickerstaff, Ph.D., A.R.I.C.

ROYAL SOCIETY— NATIONAL COMMITTEE FOR CHEMISTRY J. Barritt, B.Sc., A.R.C.S., A.R.I.C.

ROYAL TECHNICAL COLLEGE, SALFORD—
APPLIED SCIENCES ADVISORY COMMITTEE *Vacant*

TEXTILE INSTITUTE TECHNICAL COMMITTEE "D"
F. L. Goodall, M.Sc., F.R.I.C.

TEXTILE INSTITUTE UNIFICATION OF TESTING METHODS COMMITTEE R. H. Ricketts, B.Sc., A.R.C.S.

YORKSHIRE COUNCIL FOR FURTHER EDUCATION—
COUNTY ADVISORY COMMITTEE FOR TEXTILES
A. Thomson, A.R.I.C.

SECTIONS OF THE SOCIETY

HUDDERSFIELD

Chairman— E. ROLFE
Vice-chairman— R. W. Shackleton

Committee

H. Boothroyd
J. Calvert
G. England
W. W. England
F. Greenhalgh
D. Hanson
F. Jordinson
W. Lodge
R. L. Robinson
G. K. Seddon
J. Steel
J. A. Wallwork

Honorary Secretary— H. TURNER
Stoneycroft, Long Lane, Honley, Huddersfield

LONDON

Chairman— G. F. WOOD
Vice-chairman— R. A. McFarlane

Committee

H. à Brassard
A. E. Conway
J. P. Dickson
D. McCordell
L. E. Morris
C. B. Roylance
H. W. Taylor
C. C. Wilcock
R. Woods

Honorary Treasurer— F. HARRISON
c/o Clayton Aniline Co. Ltd., Bush House, Aldwych London, W.C.1

Honorary Secretary— H. W. ELLIS
"Lyncroft", 292 Crofton Road, Farnborough Park, Kent

MANCHESTER

Chairman— F. FARRINGTON
Vice-chairman— G. S. J. White

Committee

J. Boulton	W. Shaw
F. Crompton	C. P. Tattersfield
J. G. Grundy	H. A. Thomas
N. Hamer	R. Thornton
J. M. Preston	H. A. Turner
J. W. Reidy	G. M. Williams

Honorary Secretary— A. S. FERN
I.C.I. Ltd., Dyestuffs Division, Hexagon House, Blackley, Manchester 9

MIDLANDS

Chairman— A. P. KERSHAW
Vice-chairman— S. R. Meadows

Committee

A. S. Cluley	H. C. Olpin
W. A. Edwards*	W. Penn
R. Fernsby	J. Rayment
J. V. A. Haywood	J. Saunders
W. L. Langton	C. Schardt
D. B. McPherson	G. L. Thornton
C. A. Mills	A. G. Tyler

(* *ex-officio* member)

Honorary Secretary— A. W. CARPENTER
45 Westcotes Drive, Leicester

NORTHERN IRELAND

Chairman— D. A. DERRETT-SMITH
Vice-chairman— J. Montgomery

Committee

J. Clarke	H. Sharpe
A. Forsythe	W. J. Watts
J. H. Jackson	J. Wiseman
G. Reid	

Honorary Treasurer— W. J. MACNAB
43 Lansdowne Park, Belfast

Honorary Secretary— J. PORTER
22 Rosemary Park, Malone, Belfast

SCOTTISH

Chairman— R. D. ALEXANDER
Vice-chairman— R. A. Peel

Committee

R. S. Brown, Jr.	D. B. F. McAndrew
T. J. Brown	J. G. B. McCallum
A. R. Edge	G. Miller
C. H. Giles	J. Rouse
W. G. B. Grant	P. Schwarzenbach
G. D. Halley	J. A. Young

Honorary Secretary— F. ATACK
6 Banavie Road, Glasgow W.1

WEST RIDING

Chairman— S. L. PEEL
Vice-chairman— H. Foster

Committee

G. B. Angus	J. M. Goodall
J. Barritt*	C. W. Green
H. H. Bowen*	R. J. Hannay*
A. Brearo	R. Hullah
C. O. Clark	H. Jennison*
R. L. Elliott	F. Smith
F. F. Elsworth	J. B. Speakman*
M. Forbes (Miss)*	E. A. Swift
T. A. Forster	J. Waller*
R. K. Fourness	C. S. Whewell

(* *ex-officio* member)

Honorary Secretary— G. E. STYAN
Chemistry and Dyeing Department, Technical College, Bradford

BRADFORD JUNIOR BRANCH

Chairman— E. E. SUNDERLAND
Vice-chairman— R. F. Villiers

Committee

F. W. Marriott	C. S. O'Brien
M. Mawson (Miss)	J. B. Petty
H. Melville	T. Pickford
K. Mortimer	M. T. Sparks

Honorary Secretary— M. FORBES (Miss)
2 Farfield Road, Buttershaw, Bradford

LEEDS JUNIOR BRANCH

Chairman— C. B. STEVENS
Vice-chairman— C. L. Bird

Committee

P. Harris	A. R. R. Priest
A. T. Peters	J. D. Sanders

Honorary Secretary— J. WALLER
Colour Chemistry and Dyeing Department
The University, Leeds 2

MANCHESTER JUNIOR BRANCH

Chairman— G. S. J. WHITE

Committee
D. O. Douglas

Honorary Secretary— H. R. HADFIELD
c/o Dyehouse Laboratories, I.C.I. Ltd., Dyestuffs Division, Hexagon House, Blackley, Manchester 9

Affiliated Society

THE SOCIETY OF DYERS AND COLOURISTS OF AUSTRALIA

President	J. A. Eastwood
Immediate Past President	L. P. Rendell
Vice-presidents	G. A. Burns, F. D. Stevens
Councillors	A. Murray, W. C. Castle
Honorary General Treasurer	J. A. Fergusson
Honorary General Secretary	D. A. Langshaw c/o Box 3695, G.P.O., Sydney

SECTIONAL COMMITTEES

	VICTORIA	NEW SOUTH WALES	SOUTH AUSTRALIA
Chairman	W. C. Castle	J. Weinburg	J. S. Hamilton
Vice-chairman ...	R. H. Brereton	A. Murray	J. Burns
Councillor ...	E. I. Noble	L. White	—
Hon. Secretary ...	B. Firth	G. A. Burns	H. D. Bruce
Hon. Treasurer ...	R. Quinn	A. C. Sandiford	D. S. Tuckwell

Proceedings of the Society

Use of Sulphamic Acid Derivatives in the Application of Oxidation Blacks

C. ZUBER and B. JOMAIN

Meeting of the Manchester Section held at the Gas Showrooms, Town Hall Extension, Manchester, on 14th September 1951, Mr. F. Farrington in the chair

It is perhaps a little paradoxical that a lecture on a new process for the application of oxidation blacks should be given in the region which saw the birth of this class of colouring matter. Ninety years ago in this same city Crace Calvert and his collaborators, Clift and Lowe, succeeded for the first time in developing on cotton materials prints of a dark green which they christened *Emeraldine*. They noticed also that treatment with dichromate led finally to a blue–black. They had produced, in fact, the first industrial aniline black, and this was a most important step if one bears in mind that the first observations of Runge had been made in 1834, almost thirty years being necessary to find the means of applying his discovery on an industrial scale.

Since then aniline black has been a subject of great interest to research workers. Among those, from Runge to Willstätter, who have gradually perfected the methods of application of oxidation dyes, or who have increased our knowledge concerning the mechanism of their formation, may be mentioned Beale, Kirkman, Price, Higgin, John Lightfoot, Whittaker, and Green in Great Britain; Kopp, Boboeuf, Cordillot, Lauth, Persoz, Goppelsroeder, Prud'homme, Scheurer, and Noelting in France; and Hofmann, Beisenhirtz, Caro, Rheineck, Nietzki, etc. in Germany; and even then such a list is incomplete. Ulrich and Fussganger were certainly the first to study oxidation blacks obtained from diphenylamine derivatives.

The oxidation blacks, especially aniline black, have played an immense part in both dyeing and printing, and it would be difficult to estimate the number of millions of yards which have been printed in the "Prud'homme style". In its wide field of application aniline black compares with such ancient and traditional dyes as Indigo and Alizarin. Owing to its fastness and its low cost of production it has been able to maintain its place in the age of anthraquinone and azoic dyes.

Nevertheless, these oxidation blacks have not been without defects. For a long time they had a great tendency to take on a disagreeable green shade. The production of "ungreenable" blacks is now common practice, and it is particularly interesting to note that one of the simplest methods consists in using aminodiphenylamine as a base for the black.

Another defect, at least as important, and common to all the oxidation blacks, is the serious risk of degradation of the cellulose fibre during processing. It is generally admitted that, whatever precautions are taken, it is impossible to avoid a certain drop in tensile strength of the materials dyed or printed. It is important to note that, here again, aminodiphenylamine is one of the least objectionable.

Finally, if we limit ourselves to the field of direct printing with oxidation blacks, the print pastes themselves are unstable, and they are quite difficult to use in conjunction with other classes of dyes.

It was logical to think that certain of these defects might be avoided by using, instead of the bases themselves, which are soluble only in an acid medium, derivatives which can be dissolved in neutral or alkaline media and which, in spite of that, will condense on oxidation. It was therefore natural to investigate such derivatives of aminodiphenylamine, as this base gives particularly fast blacks.

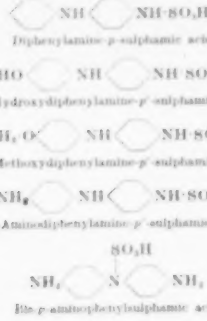
In this connection our colleague, Dr. Robert Lantz, has made a special study of the application of the sulphamic acid derivatives. His first patent [1] is dated 1936, when he was working at St. Denis.

The conversion of a primary amine $R{\cdot}NH_2$ into an alkali-metal sulphamate $R{\cdot}NH{\cdot}SO_3Na$ indeed offers the possibility of making the original amine soluble in an alkaline or a neutral medium. The solubilising group SO_3Na has the additional property—and this is particularly useful—of being easily eliminated by acid treatment, preferably warm. It does not prevent the rest of the molecule from undergoing oxidation to a black: i.e. the sulphamate corresponding to an amine giving rise to an oxidation dye may itself be oxidised and form the same dye. It can even be shown that desulphonation takes place after and not before the appearance of the dark blue coloration characteristic of the commencement of oxidation.

Numerous trials have proved that, by a fortunate coincidence, the sulphamates of certain amino derivatives of diphenylamine are oxidised in a simpler manner than aniline. In other words, by this method it is easier to obtain an oxidation black from aminodiphenylamine than to produce an ordinary aniline black.

Before fixing the formula of the product known as Solanile Black, Lantz had made trials with many others. The formulæ of several derivatives of diphenylamine capable of giving good results are given on the next page.

To sum up, it is thus possible to obtain a dye, of good solubility in a neutral medium, capable of being easily oxidised and thus giving rise to a good ungreenable black, which does not attack the fibre provided certain simple precautions are taken.



Solanile Black is of greatest interest in printing, for with it one can obtain deep blacks of excellent general fastness on cellulosic and union materials, and it can be used either alone or side by side with many other types of dye and even in combination with some of them.

The printer has at his disposal many types of black, and in order of interest we may mention—

(1) Vat dyes, Solasols (Indigosols), and Naphtazogenes (Rapidogens), which possess excellent fastness to water, washing, light, and often to chlorine, but where cost of production is often high.

(2) Chrome and sulphur dyes, with quite good fastness to light and washing.

(3) Acid dyes, possessing poor fastness to light, water, and washing, which are used for bright effects on viscose rayon.

(4) Basic dyes, which are interesting because of their resistance to the reducing action of Rongeol and permit the production of outline blacks along with white or coloured discharges.

(5) Direct dyes, of moderate fastness and often used for cheaper articles.

(6) There remain two dyes, closely related to Solanile Black, which are of great value in spite of certain defects they possess, viz. aniline black and diphenyl black.

It is in direct printing that Solanile Black is most useful, in particular in all cases where aniline black would cause severe degradation of the fibre, as on delicate viscose rayon materials.

As the padding of Solanile Black is possible, it is evident that white and coloured resists may also be executed. The principle is very simple and the results obtained are generally quite satisfactory.

The fastness properties of the new dye permit its use for the production of shades fast to light and to washing, and consequently justify its association with other classes of fast dyes. When used as a black the fastness to light is $\frac{7}{8}$; as a grey 4–5. Fastness to washing at the boil and to soda boiling is 5 in both cases.

Generally speaking, the colour yield on viscose rayon is better than on cotton, particularly unmercerised cotton, and as the quantity of dye indicated in our recipes is based on the latter material, the user may, in many cases, reduce the amount of Solanile Black by 20–30% for viscose rayon.

Direct Printing

Solanile Black may be printed by aerograph, block, screen, or machine methods with equal success and without serious modification of the recipe. Only the nature and quantity of the thickening have to be adapted to the process to be used.

Three types of design may require to be printed—

(i) Black designs of large or small areas on white or dyed material, alone or in association with other dyes of different classes.

(ii) Outline blacks to emphasise and enhance another colour.

(iii) Finally, printed areas may be applied on top of a shade already printed, i.e. fall-ons.

It is in this last application that the study of the use of Solanile Black with other dyes is most fruitful, because if the results obtained are satisfactory, then obviously the dye will work equally well as an outline black even in patterns where the fall-on is accidental, as in the case of a misfit.

SOLVENT

Above all the solvent must favour solution of the colour in water and, at the same time, have a swelling action on the fibre, particularly in the case of viscose and acetate rayons.

Many auxiliary products were examined, and thiodiglycol (Solutene Cl) was found to give the best result. Use of this product gives deep blacks on all vegetable fibres and cotton– or viscose rayon–wool mixtures, its one drawback being the disagreeable odour during preparation and steaming.

With diethylene glycol (Solutene DG) one obtains a slightly redder and weaker black, but the print paste is odourless.

It is curious that polyglycol (hexanetriol, Solutene HDG) and monoethyl glycol (Solutene EM) not only give a redder shade and inferior yield, but they also cause a certain stiffness of the printed portion, which is difficult to remove during rinsing and soaping. Hexanetriol has a slight odour of pine oil.

The use of urea to replace the solvents mentioned above gives practically the same yields, although we are investigating the possibility that this results in lower washing fastness.

THICKENING

In our opinion, starch-tragacanth gives the best results with blotches, because it can, if necessary, be completely removed by a desizing agent, leaving a perfectly soft handle. It is, of course, equally satisfactory for fine line motifs.

The following may be used without affecting the development of the colour—

(i) Wheat starch alone for clear designs and without crossovers.

(ii) Tragacanth alone, or starch–tragacanth, with an addition if required of 20–30% British gum (1 : 1) to improve the clarity of the prints and to facilitate the work of the block printer.

(iii) Purified industrial gums, e.g. crystalline gum, gum labiche, Nafka crystal gum, etc., although with Solanile Black these gums give films which are difficult to remove by washing.

We recommend them for the production of fine line work.

(iv) Natural soluble gums, e.g. gum arabic and gum senegal, which, however, give a harsh handle on viscose rayon and are more suitable for fine outlines.

(v) Cellulose glycollate derivatives of the Prestofen type, such as carboxymethyl cellulose or Solvitex BG or ST.

(vi) Carob gum (locust-bean gum, Tragon A), used alone or with the addition of starch. Certain qualities of carob gum precipitate when ammonia is added to the print paste; in such cases, less ammonia should be used (e.g. 5 g./kg.), which may slightly reduce the stability of the paste.

DEVELOPMENT

The development of Solanile Black is brought about by three chemical agents—

(a) *Acid-producing Agent*

It is necessary for a weak acid to act on the colour, and this is generally a non-volatile organic acid. The acid must be produced progressively in the presence of the colour in order that colour formation does not take place until after the application of the print paste to the material. This is easily done by using an appropriate ammonium salt which decomposes during steaming to give rise to the corresponding acid. It is interesting to note that if the acid is added during steaming (acid steaming), it is almost unnecessary to add an ammonium salt to the colour.

(b) *Oxidising Agent*

All our investigations have led us to the conclusion that only sodium or ammonium chlorate gives satisfactory results. Chromates and dichromates only partly develop the colour, and nitrous acid from sodium nitrite transforms it into a product which it is almost impossible to oxidise to a black.

It is evident that these effects will themselves greatly influence the choice of dye suitable for association with Solanile Black.

(c) *Oxidation Catalyst*

The oxidising action of the chlorates is completely effective only in the presence of a catalyst, and we recommend the use of a 1% solution of ammonium vanadate.

APPLICATION

The first method of application examined in our laboratories was the ammonium thiocyanate–sodium chlorate recipe, which gave good results, a deep black being obtained on viscose rayon and mercerised cotton even with a neutral steaming of only 3–5 min. However, on unmercerised cotton only a more or less dark grey was obtained, and a modification of the recipe for use on this material was sought. An alternative acid-producing agent was needed, and although our investigations still continue, the following observations can be made—

(i) Ammonium tartrate does not produce satisfactory oxidation of the black and is entirely unsuitable.

(ii) Ammonium sulphate, ammonium citrate, and diethyl tartrate give good blacks, provided that the steaming time is increased to at least 15 min.

(iii) Finally, more recent trials using ammonium oxalate or ammonium chlorate have given excellent results.

Until now we have advised the use of a 10% Solanile Black print paste, but trials have shown that in many cases 8% is sufficient, and in some cases even 6% will produce a satisfactory result. An appropriate reduction in the chemical content of the paste should be made at the same time.

Finally, an addition of Rongeol (Formosul)—4% of a 10% solution—will assist the keeping qualities of the paste.

Some typical recipes are shown in Table I.

TABLE I

Printing Paste Recipes

	Oxalate	Chlorate	Thio-cyanate		Oxalate
	10%	10%	10%	8%	6%
Solanile Black ...	100	100	100	80	60
Thiodiglycol ...	90	90	90	70	70
Hot water	90	70–130	90	135	225
Starch–tragacanth	600	510	530	550	550
Heat for several minutes at 60–70°c. Cool completely and add—					
Ammonium thiocyanate (1 : 1) ...	—	—	120	100	—
Ammonium oxalate crystals	30	—	—	—	25
Ammonium chlorate (18° Tw.) ...	—	180–120	—	—	—
Sodium chlorate crystals	50	—	30	25	30
Ammonium vanadate (1%) ...	20	50	20	20	20
Ammonia (20%) ...	20	—	20	20	20
	1000	1000	1000	1000	1000

On viscose rayon–wool and cotton–wool mixtures we suggest the use of increased quantities of ammonium oxalate and sodium chlorate, and a longer steaming time may be necessary.

Furthermore, when printing Solanile Black as a fall-on on Naphtazogenes or Naphtazol Directs developed by acid steaming, we recommend the use of 30 g. ammonium oxalate crystals per kilogram.

STABILITY OF PRINT PASTE BEFORE PRINTING

Solanile Black print pastes can be kept for weeks without taking any special precautions, and so long as they are protected against drying out no appreciable difference in colour yield can be detected between these and freshly prepared pastes. If, by chance, the old paste shows pronounced crystallisation, due not to desiccation with loss of water but to the accidental formation of crystals, simply warming to 20–40°c. will bring the paste back to its former consistency.

The use of diethyl tartrate as acid-producing agent avoids formation of crystals, which are, in any case, not sufficiently hard to cause doctor streaks or damage to the rollers, but the steaming time must then be increased to at least 15 min. If

crystals have formed and they do not return into solution on rewarming, they probably consist of calcium oxalate formed by hard water. The use of 1·5 g. Calgon per litre of water will in this case be beneficial. The new recipes do not suffer from this defect of crystallisation, and our trials have shown that even several weeks after the preparation of the print paste no crystals are formed, providing the paste does not suffer any abnormal drying.

SIGHTING COLOUR

Although the print paste containing tragacanth or other thickening has a distinct brown colour, it is difficult to see whilst being printed on white material. If there are doctor streaks or scumming, due to the doctor or the roller, these defects, almost invisible to the eye, may quite easily be shown up by adding to the print paste just before use a small amount of Detector Red 6BS, about 0·5–1 g./kg., giving an intense coloration of the paste. Detector Red 6BS is dissolved with 5–10 times its weight of warm water and added direct to the print paste immediately before printing. The sighting colour is completely removed during the washing which follows steaming. The cost of the print paste is increased by 2–3%, but the printer is able to work in security with the assurance that all printing faults, previously almost invisible, will now be revealed without the aid of a special lamp.

PRINTING PROCESS

In general, Solanile Black behaves like the Solasols (Indigosols) applied by the analogous steaming recipes, and, like these dyes, it sometimes provokes a slight attack on the copper rollers when the machine is stopped for any length of time. It appears that, as in the case of the Solasols, this defect is due to the chemical products contained in the print paste rather than to the dyes themselves. The use of chromium-plated rollers is to be recommended, as these prevent such an attack.

SENSITIVITY TO OVERHEATING

With machine printing the pieces generally pass into a dryer, in which the heat is provided by steam-heated plates or by circulating hot air. In general, in Great Britain, drying cylinders replace our Continental dryers. The printed material remains for a more or less short time either in contact with a metallic surface in the region of 100°C. or in a current of air at 60–70°C., which might accidentally become hotter. Even when the temperature rises above 90–100°C., or when the time of contact with the heated surface is extended to several minutes, the yield is not affected. However, if overheating is very pronounced, it may, in certain cases, produce evaporation of part of the water in the print paste, causing an increase in the concentrations of oxidising agent and acid-producing salt, with possibly a premature chemical reaction upon the fibre under conditions which cause tendering.

KEEPING OF PRINTED MATERIAL BEFORE STEAMING

With limited steaming capacity it may not be possible to steam the prints the same day, but this delay is generally not inconvenient, except in particular cases, as, for example, with aniline or diphenyl black or vat dyes and white and coloured discharges. If Solanile Black is printed alongside vat dyes or discharge pastes, it is quite evident that the pieces should be steamed with as little delay as possible; but in the case of other combinations, and particularly when used alone, prints of Solanile Black can be left for several days before steaming, without adverse effect. It is noticeable that the development of the black is already well under way after 24 hr., in the places which are exposed to the air, e.g. at the selvedges and at the top laps of the printed pieces.

DEVELOPMENT

Solanile Black may be developed by several processes, which makes it suitable for a large number of styles.

(*a*) The most widely used method is to steam in a neutral atmosphere for 5–60 min., depending upon the type of equipment or upon the other types of dye used in the print. Prolonged steaming does not affect the yield of Solanile Black and even permits the use of other acid generators such as ammonium sulphate and citrate or diethyl tartrate.

(*b*) Acid steaming for 5 min. gives an excellent yield either alone or when used in combination with Naphtazogenes printed by the caustic soda method. In this particular case, the steamer being charged with acetic and formic acids, it is unnecessary to use an acid producer in the print paste, thus slightly reducing costs, except in fall-on styles with Naphtazogenes, where an increase in acid salt may be necessary*.

(*c*) Development can be achieved by hanging the goods for two days, preferably in a warm humid atmosphere, although preliminary examination seems to indicate that this type of development increases the tendering effect.

KEEPING AFTER STEAMING

When the black has been developed, rinsing of the pieces may take place from a few hours to several days later. We advise giving the pieces an air passage of several seconds before plaiting down, in order to cool them on leaving the steamer.

RINSING AND SOAPING

It is as well first to rinse in either cold or tepid water to eliminate the greater part of the thickening, and then finish by passage in rope form or open width through a hot water bath, finally soaping with 2–5 g. soap and 1 g. soda ash per litre for 10–20 min. at the boil, provided that the material is cotton and the other colours have sufficient fastness to washing. With delicate materials, or when the accompanying colours have only poor wash fastness, the soaping temperature must be kept down to 40–50°C. This applies when Solanile Black is printed on direct grounds either alone or along with white or coloured discharge effects. In this case, the use of a sulphated fatty alcohol is desirable. If large surfaces are printed on a material having a high affinity, e.g. mercerised cotton, and if washing and soaping are done under unfavourable conditions, e.g. at a short liquor ratio, the whites may be discoloured. In this case,

* Recent developments show that, where it is necessary to increase the acid salt content above 3%, addition of ammonium sulphate is preferable to increasing the quantity of ammonium oxalate.

we advise soaping in a bath containing 2 g. of an anion-active product per litre. If this soaping is done in acid medium, e.g. with 0·5 g. acetic acid (9 Tw.) per litre, the results are better still.

An ungreenable black is obtained without the use of dichromate for rinsing—in this respect it behaves like diphenyl black. The shade obtained on vegetable fibres is practically the same as that of other oxidation blacks and Indigosol blacks, but not quite so red as Rapidogen Black IT.

Tendering

It is well known that aniline black causes tendering of cellulosic fibres in spite of all precautions taken in applying it. The degree of attack depends to a large extent on the working conditions and the type of material; it may be of the order of 15–20% on cotton, and may reach dangerous proportions on viscose rayon, making it difficult to apply successfully on delicate viscose rayon cloth.

Diphenyl black, which requires less mineral acid for development, generally has slightly less effect under normal working conditions, and degradation can be of the order of 10–15% on cotton.

Solasols and Indigosols, like Solanile Black, are developed by the action of an acid and an oxidising agent in the presence of an oxidation catalyst. Consequently, under unfavourable working conditions—overheating of the printed material, steaming with insufficiently saturated steam, etc.—they are liable to cause slight degradation of the fibre, owing largely to the formation of oxycellulose by the action of the oxidising agent. In general the degradation is still greater when steaming is prolonged for 30–60 min.

The use of industrial gum when printing blotches may lead to a weakening of the fibre by making it more brittle, and it is for this reason that we recommend for this work thickening agents which are easily removed by washing with water.

We have studied the degradation to which the fibre is subjected by the action of the Solanile Black and the chemical reagents contained in either the print paste or the pad liquor.

The degree of degradation was examined by two methods—

(1) Tensile strength tests on standard-size strips in the direction of the warp.

(2) Cuprammonium fluidity tests.

These tests have shown that on cotton Solanile Black does not cause any appreciable tendering, whatever standard recipe is used for its application (ammonium thiocyanate, ammonium oxalate, or ammonium chlorate), with a steaming time of 10 min., especially when it is used in the lower amounts suggested in our new recipes.

The same prints steamed for 1 hr. do show slight attack, of the order of 1·5–6%. This very slight degradation is produced only with prolonged steaming, which is not recommended because it is unnecessary for the development of the black. The ammonium chlorate recipe appears to be slightly more dangerous than the other two, but in any case degradation does not exceed 6%.

Even under the most severe conditions, viz. with a steaming time of 60 min., the degree of degradation is no greater than that frequently produced during normal bleaching.

On viscose rayon, results have been practically the same as for cotton with short steaming times, but when steaming is increased to 30–60 min. degradation is slightly accentuated, although it never reaches the same degree as that produced by aniline black. Consequently, short steaming methods are particularly advisable on viscose rayon. It also appears, though this factor has not yet been finally verified, that the mineral pigments contained in certain man-made fibres are capable of catalysing the degradation. This is the case, for example, with matt rayons containing zinc oxide or titanium dioxide. Similarly, products of the type of Reserve Salt O, Ludigol, Albatex BD may also slightly favour degradation of matt viscose rayon. These products are applied in solution (5–10 g./litre) by padding on materials dyed with direct dyes intended for white or coloured discharges, thus avoiding doctor streaks and other defects due to accidental deposition of Rongeol on the material.

Solanile Black Styles

In considering how Solanile Black can be printed with other dyes to obtain multicoloured effects, those types of dye having poor fastness will be briefly mentioned, before those combinations which are of interest to the printer for fast styles are discussed in greater detail.

1. DIRECT DYES

Direct dyes may be printed by the usual recipes using disodium phosphate alongside Solanile Black applied by one of the above methods. The black develops satisfactorily even with an accidental fall-on. Similarly, Solanile Black may be applied by printing on direct grounds. This print-on style may also be associated with a white or a coloured discharge.

2. MORDANT DYES

These may be printed by the normal method using salts of chromium, aluminium, iron, cobalt, nickel, and zinc. With chrome mordants the three normal recipes may be used—(i) chromic acetate, (ii) urea and chromic acetate, and (iii) sodium chromate. It is preferable in this style of printing to run the Solanile Black last, so that it develops well and so that the black motifs are very distinct. The acetic or thiocyanic acid produced during steaming can only assist the development of the black.

3. VAT DYES

These would appear at first sight to present difficulties in combination with Solanile Black, since the latter requires an acid oxidising medium whilst the vat dyes require an alkaline reducing medium for their fixation. It would be expected that the vat dyes would act as resists for the black. This is exactly what does happen when Solanile Black is printed on top of a vat dye prepared by the normal potash–Rongeol method. The acidic

agent necessary for the development of the black is neutralised by the potassium carbonate, thus causing a loss of alkali available for the vat dye, which then only partly reduces to the leuco derivative.

If one wishes to fix the vat dyes perfectly and reserve the black, the alkali content must be slightly increased to replace that lost by neutralisation by the oxalic or thiocyanic acid of the Solanile Black print pastes.

Three cases may then be considered—

(*a*) Solanile Black is printed along with, but not touching, vat dyes. In this case, there is no danger of resisting the black, and a simple steaming in the Mather & Platt steamer is sufficient to develop both classes of dye. In machine printing it is advisable to print Solanile Black first, to avoid carrying over the alkaline vat print paste, which cannot be avoided if the vat dyes are printed first, owing to the surface of the rollers picking up some of the colour already printed on the material. Carry-over of the Solanile Black into the vat print paste is of small consequence, as it is completely neutralised by the potash and Rongeol.

(*b*) Solanile Black in tight-fitting patterns with vat dyes. Good results can be obtained in this style, although a misfit causing an accidental fall-on will lead to incomplete development of both colours.

(*c*) Fall-on of Solanile Black on vat dyes, e.g. where black veins are required on a leaf printed with Solanthrene Brilliant Green B Paste Fine or Impra-powder. Since it is impossible chemically to bring together oxidising and reducing agents, acids and alkalis, without mutual interaction and destruction, it might be possible to effect fixation not simultaneously but in two successive stages. These requirements may be met by printing the vat dyes by the Colloresin process and then the Solanile Black by one of the recommended recipes. The black in this case can be printed on top of the vat dyes without difficulty.

Dry, and then steam for 3–7 min. to develop the black. Finally, to develop the vat dyes, pad through a bath containing Rongeol and potash, and then dry and steam; or, alternatively, pad through hydrosulphite and caustic soda, and then steam without intermediate drying. The results obtained are excellent.

4. SOLUBILISED VAT DYES

These are particularly suitable for use with Solanile Black both in open and in fall-on patterns. They give, with the assistance of a few Naphtazogenes, a very wide range of colours with excellent fastness to light and washing. Fall-on styles with Naphtazogenes and Solasols are possible, but are largely influenced by depth and type of engraving. For example, pegs in Solanile Black are normally successful, but fine lines generally need deeper engravings, and an addition of 1–3% ammonium chloride or ammonium sulphate crystals will help. In machine printing, the Solanile Black must be printed before the Naphtazogene or Solasol, while the reverse applies in screen printing.

The use of a starch or water roller after Solanile Black avoids carry-over and soiling of subsequent print pastes.

With Solasols the steaming processes give the best results and alone allow simultaneous development of the black and the Solasols. With the Solasol printed with ammonium thiocyanate–sodium chlorate, ammonium oxalate–sodium chlorate, or diethyl tartrate–ammonium chlorate, alongside Solanile Black with or without fall-on, accidental or otherwise, a neutral steaming of 7–15 min. develops all the colours, although this may be followed by a short acid steaming to complete fixation.

In the cases of Solanile Black–Solasol combinations developed by the open bath methods with sodium nitrite, sodium dichromate, or sodium chromate, followed by passage through a sulphuric acid bath, numerous trials have shown that the black cannot be developed simply by the acid and oxidising agent of the developing bath. It is therefore necessary to work in two stages, as in the case of the vat dyes by the Colloresin process; i.e. the black must be developed by steaming before the material is padded in the acid bath.

Another difficulty under these conditions is that Solanile Black does not develop completely in the presence of nitrous acid produced by the decomposition of sodium nitrite. Consequently, when printing Solasols by this method, the nitrite is added to the sulphuric acid bath, 4 g. nitrite and 20 c.c. concentrated acid per litre, at a temperature of only 30°C., with a very short passage of only 10 sec. for development. If nitrous fumes are evolved too rapidly, addition of Solasol Salt X or urea will prevent this. A further method for reducing the formation of nitrous fumes is to use an open soaper, passing the cloth first through a bath of sodium nitrite and then through sulphuric acid.

This method can be used even when the black is developed by hanging without steaming, but in this case the soda ash usually added to stabilise Solasol print pastes should be reduced to a minimum or even omitted, as this alkali acts as a resist for the black.

If sodium dichromate or chromate is used as oxidising agent in the sulphuric acid bath, or even in the Solasol print paste, there is no appreciable change in the shade of the black when developed by acid steaming. Neutral steaming in certain cases only partly develops the black when it is overprinted on a Solasol. It may help to increase slightly the acid salt content of the black.

5. NAPHTAZOL DIRECT OR RAPID FAST DYES

These may be printed with Solanile Black under certain conditions. They are generally printed with caustic soda and sodium chromate, then developed by neutral steaming followed by an organic acid bath, by acid steaming, or even by hanging for 24 hr. When the caustic soda method is used, it is essential to develop both colours by acid steaming for 5–10 min. With neutral steaming followed by an organic acid bath, the two classes of dye are fixed in an open pattern or in a close fit, but where the black falls on the Naphtazol Direct both colours are only partly developed.

6. NAPHTAZOGENES OR RAPIDOGENS

Two methods of application are generally used—

(a) Acid Steaming or Organic Acid Bath

This method gives the better yield and brightness. The Naphtazogenes are in this case printed with caustic soda and steamed for 5–10 min. in an atmosphere of acetic and formic acids. Solanile Black prepared by the usual recipe may be applied side by side, in contact, or even in fall-ons with Naphtazogenes. The black develops perfectly by acid steaming on Naphtazogene blotches. It is often possible in these circumstances to reduce the amount of acid salt in the Solanile Black print paste down to e.g. 10 g. ammonium oxalate crystals per kilogram, except when printing black fall-ons, when it is better to use 30 g./kg. In screen printing, as with the Solasols, the black should be printed last for perfect development.

(b) Neutral Steaming

Combinations of Solanile Black with Naphtazogenes using a neutral developer prevent development of the black because of the evolution of alkaline fumes.

7. FAST SALTS AND BASES

These are particularly employed for imitation batik styles or "Africana". In general, imitation batiks are produced by printing chrome dyes and Fast Salts or Bases on Naphtazol prepares. In this case the material is padded with an alkaline solution of the Naphtazol, then dried in the hot-flue, and printed without delay with the above dyes. Chrome dyes are printed with 70–100 g. of acetic acid (6° Bé., 9° Tw.) per kilogram to neutralise the caustic soda in the prepare. The quantity of acid must be adjusted to the alkalinity of the material, using for preference a slight excess, indicated by a white halo round the motif printed in the chrome dye.

Similarly for the Solanile Black, the acid salt content of the print paste must be increased in proportion to the alkalinity of the material. For example, with a Naphtazol A prepare (10 g./litre) and 130% expression, 70–90 g. of ammonium oxalate per kilogram is required in the Solanile Black print paste. The Bases and Fast Salts to be used must withstand the steaming (3–7 min. neutral steam) necessary for development.

8. WHITE OR COLOURED DISCHARGES

These may be worked with Solanile Black, but preferably not in contact. The reducing action of the Rongeol tends to prevent development of the black by destroying more or less completely the oxidising power of the sodium or ammonium chlorate. Nevertheless, a fall-on of Solanile Black on a white discharge containing up to 50 g. Rongeol C extra powder per kilogram does not interfere with development of the black, and an addition of Reserve Salt O to the black allows its use on discharges containing up to 70–100 g. Rongeol per kilogram. Again, the Solanile Black should be printed first. The amount of Reserve Salt O is determined by the strength of the discharge and the depth of shade and dischargeability of the dye.

Solanile Black shows an advantage over aniline black in discharge styles, as in accidental fall-ons no brown halo is produced.

In the case of coloured discharges with vat dyes and/or white discharges containing sodium or potassium carbonate, it is evident that in fall-ons the conditions are similar to direct printing with vats, and the results cannot be other than defective.

To summarise, then, the following styles with Solanile Black are of particular interest—

(1) With Solasols and Naphtazogenes using acid steaming for the development of all three classes of dye.

(2) With white discharges and coloured discharges containing vat dyes without fall-on.

(3) With vat dyes, particularly in open pattern.

Resists

It has already been mentioned that Solanile Black is partly reserved by Rongeol and other reducing agents, and that it is possible to retard development by printing on top of a sufficiently alkaline print paste. This effect is used to obtain white or coloured resists on vegetable fibres.

PAD DYEING

This is of limited interest on cotton, except as a grey, as Solanile Black cannot compete economically with aniline black. However, on viscose rayons, where tendering is an important consideration, Solanile Black can be used, and, furthermore, it is attractive economically, for as little as 3–5% Solanile Black produces a good result.

The make-up of the pad liquor is more or less the same as that used for direct printing. As usual in this class of work, it is convenient to add a little tragacanth, but the best results have been obtained with locust-bean gum.

The viscose rayon material after padding is dried and then steamed for 7 min. In order that the shade shall be perfectly developed, it is recommended, particularly when using vat resists, that the material should then be treated at 60–70°c. in a bath containing per litre—

5 g. ... Sodium dichromate
5 c.c. ... Acetic acid (10° Tw.)

WHITE RESISTS

Pad the material as above, dry (preferably in a hot-flue), and print with a paste containing Rongeol and potash, which neutralises the acidity necessary for the development of the black. An addition of titanium dioxide or zinc oxide to the paste may be beneficial. After printing and drying, steam for 7 min., rinse, then soap, and treat with dichromate if desirable. The resist obtained is very clear and distinct, and a perfect white, altogether comparable with an aniline black resist.

COLOURED RESISTS

Vat dyes give excellent results. After steaming for 7 min., passage through an acid dichromate bath, as for the pad dyeing, completes development of the black and oxidises the vat dye.

Naphtazogenes, although printed with caustic soda, do not give good results. Though the resist is almost perfect with an acid steaming of 3 min., should the steaming be slightly prolonged the acidity of the steam gradually develops the black, which considerably flattens the shade of the resist, rendering it unsuitable. With short steaming the resist is acceptable, but equally the yield of the Naphtazogene is poor.

TENDERING

Tensile strength tests show that the tendering of viscose rayon pad-dyed by the method indicated does not exceed 5%, which is practically negligible and much less than the tendering produced on the same fibre by aniline black, which can amount to as much as 25%.

Mixtures with Solanile Black

It is possible to shade certain dyes by adding varying proportions of Solanile Black. For example, the Solasols lend themselves to such mixtures, as their method of development is practically the same as that used for the black. The Solasol is prepared as for one of the steaming methods—ammonium thiocyanate, sodium chlorate, ammonium chlorate, etc.—and the necessary quantity of a Solanile Black print paste incorporating the same oxidising agent is added. The acid agent will generally be ammonium thiocyanate or oxalate, but its nature is immaterial.

It is thus possible to shade Solasol dyeings, producing e.g. nigger browns, navy blues, bottle greens, burgundies, etc. at will, and an attractive grey is obtained with Solasol Indigo 4B and Solasol Red Violet NS. The fastness properties of these mixtures are practically the same as those of the individual constituents.

Cost of Preparation

Solanile Black is cheaper than blacks of the vat, solubilised vat, and even stabilised azoic types. If, on the other hand, it is slightly more expensive than diphenyl black and certainly dearer than aniline black, it possesses indisputable advantages over these two types.

Above all, the application of aniline black and even diphenyl black demands much skill, special material, and careful control to achieve a good result. Solanile Black may be applied without any difficulty, whatever the working conditions.

As opposed to aniline and diphenyl blacks, whose print pastes are unstable, and which must be printed, steamed, and finished as quickly as possible, Solanile Black print pastes are stable for several weeks, may be developed by either steaming or hanging, as working conditions permit, and do not require to be finished immediately.

The shade obtained is ungreenable without recourse to dichromate, which is essential in the case of aniline black.

The risk of fire caused by overheating does not exist with Solanile Black, and the colour yield remains consistent.

Tendering of cellulosic fibres, often so pronounced with aniline black, is reduced to such proportions with Solanile Black that this attack is of no more consequence than that produced by normal bleaching.

The possibility of combinations with other dyes is an added advantage. Aniline black can only with difficulty be used with Naphtazogenes, Naphtazol Directs, and Fast Salts and Bases, and Solasols may be applied only by two steaming processes (ammonium chlorate and diethyl tartrate).

Diphenyl black itself can be associated with Solasols only by the chromate process, certain precautions being taken. If Naphtazogenes are used with this dye they develop prematurely and incompletely when the black falls on them, which is almost inevitable in outline work. With Naphtazol Directs, the fumes given off by the diphenyl black during steaming are sufficient to destroy this type of dye.

* * *

The authors' thanks are due to the many printers in this country who have kindly contributed patterns illustrating the use of the new dye.

COMPAGNIE FRANÇAISE DES MATIÈRES COLORANTES
CREIL
(OISE)
FRANCE

Reference

LANTZ, R., *F.P.* 820,935, *B.P.* 498,755.

The Continuous Dyeing of Vat Dyes

(the Standfast Molten Metal Technique)

J. ARDRON, M. R. FOX, and R. W. SPEKE

Meeting of the Northern Ireland Section held at the Queens Hotel, Belfast, on 12th December 1951
Mr. D. A. Derrett-Smith in the chair

(1) Introduction

In the British Isles prior to 1950 interest in the continuous dyeing of vat dyes, apart from long established processes, such as warp dyeing, etc., was mainly academic. Leuco padding and dyeing on the open range were practised to a limited extent, but the newer American methods, viz. the pad–steam process and the Williams unit technique, although they had been examined on the laboratory scale by both dye-users and dye-makers, were adopted in bulk working only on a very restricted scale. The inherent difficulties from the British viewpoint in both methods, viz. shade matching, shade changing, and end-to-end uniformity in "short runs", were responsible for this state of affairs. The phrase "short runs" is used with considerable ambiguity in many cases, but the American and British definitions of "short runs" are clearly stated by Williams [1] (2000–5000 yd.) and by Boardman [2] (< 1000 yd.). When details of the Standfast molten metal machine were first published in March 1950 there was an immediate change in attitude, mainly because the process was adaptable to short runs (i.e. down to one piece), incorporated a method of accurate shade prediction, and had been proved by the inventors [3,4] to be adaptable to the requirements of the British commission dyer.

We have attempted to evaluate this process on independently constructed apparatus.

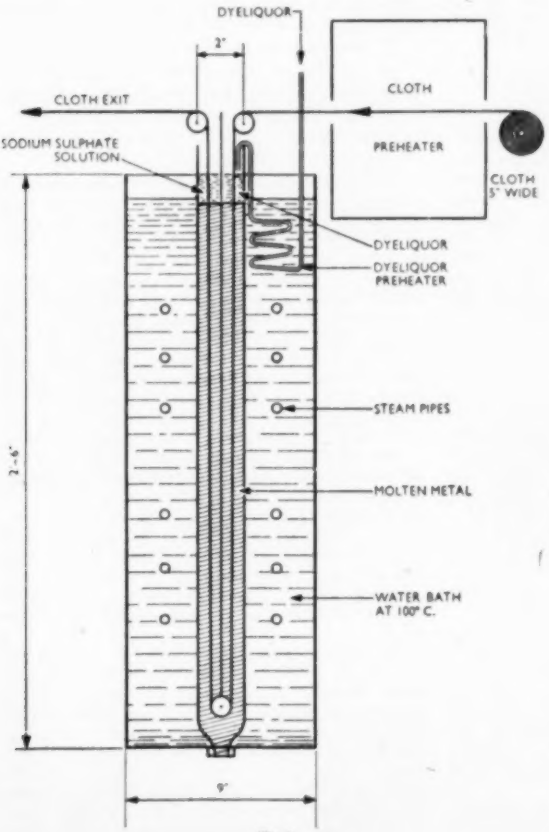


FIG 1

(2) Laboratory Molten Metal Machine

The laboratory machine used (Fig. 1) consists of a stainless steel trough, 6 in. wide, 30 in. high, and 2 in. thick, filled with Woods metal. The trough is divided into two compartments by a central fixed plate running almost to the bottom roller. The whole is immersed in a boiling water bath to maintain the metal alloy at the necessary temperature. No separate or removable compartments are provided for the dye or salt solutions, as these are formed by the sides of the trough and the central partition. The compartments have a working volume of 300 c.c. at a depth of 3 in., and they are drained by two cocks inserted just above the surface of the metal. The dye liquor is prepared at room temperature, and then fed into the machine through a preheater coil consisting of some 10 ft. of stainless steel tube of 0·2 in. internal diameter immersed in the water bath. Dye liquor takes 10–15 sec. to pass through this preheater, which raises its temperature from 20°c. to 80°c. The sodium sulphate solution is made up at a concentration of 50 g. anhydrous salt per litre, and is fed into the exit compartment through a preheater similar to that used for the dye liquor.

The cloth, 5 in. wide, runs from a batching roller through a preheater, which is merely an arrangement of electrically heated contact

plates. After passing through the dye liquor the cloth has a 50 in. passage through the molten alloy. Running speeds can be varied to give periods of contact with both dye liquor and metal alloy very similar to those quoted by Boardman [5] for the bulk machine, as shown in Table I.

TABLE I

Bulk Machine			Laboratory Machine		
Running Speed (yd./min.)	Time of Immersion in Dyebath (sec.)	Time of Immersion in Metal (sec.)	Running Speed (yd./min.)	Time of Immersion in Dyebath (sec.)	Time of Immersion in Metal (sec.)
30	0·4	0·7	15	0·3	5·5
120	0·1	1·4	50	0·1	1·7

The fabric emerges through the salt solution, passes through a nip, which provides the necessary motive force, and is then oxidised, rinsed, and soaped discontinuously.

Using this apparatus a programme of investigations was undertaken with a view to obtaining first-hand information on the factors affecting the application of vat dyes to cellulosic textiles under such conditions. The evaluation of the leuco vat dyeing process (as opposed to the development of pigment paddings) has been described elsewhere [5,6], and will therefore be only briefly reviewed.

(3) Laboratory Investigations

3.1 LEUCO VAT DYEING PROCESS

The necessary constituents of the feed liquor were first determined. It was shown that the optimum rate of reduction of the vat dye was achieved when the sodium hydrosulphite concentration was twice the caustic soda (flake) concentration. Using proportionately higher concentrations of sodium hydrosulphite there was a danger of the development of the acid leuco compound of the vat dye, particularly if the feed liquor was allowed to stand before running. Although the minimum requirements of reducing agents varied from dye to dye (e.g. many dibenzanthrone derivatives will fix with very much lower quantities of caustic soda and sodium hydrosulphite, per unit weight of dye, than the indanthrone types), it was found possible to obtain a condition where all vat dyes of the Caledon class could be applied with equal facility. The reducing agent concentration must be varied according to the dye content of the feed liquor, and the relation between these two variables was therefore determined experimentally, the results being interpreted graphically in Fig. 2. This graph indicates that the application of vat dyes by the molten metal process is much more economical in its consumption of reducing agents than either jig dyeing or the pad–steam process [5,6].

It was not found necessary to use dyes of pigment-padding quality in the preparation of the feed liquor, equal tinctorial value being obtained from the Paste Fine and 300 Powder Fine brands of Caledon dyes. Caledon Olive GL and Carbindone Black B are unsuitable for application by the molten metal process, as they contain reactive sulphur compounds which contaminate the metal alloy.

The comparative efficiency of wetting agents for this process was assessed by dyeing unprepared

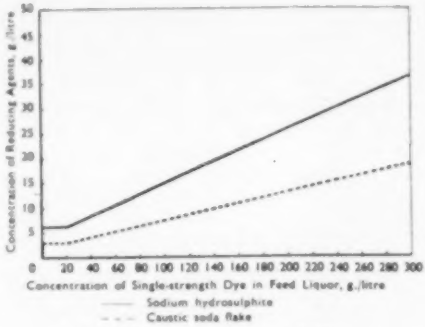


FIG. 2.—Leuco Dyeing of Pigment Paddings (with intermediate drying)

grey cotton fabric with varying concentrations of wetting agent in the feed liquor. It was shown that the novel requirements for a wetting agent suitable for this process were not exhibited by the existing products tested, all of which were deficient in one or more of the following properties—

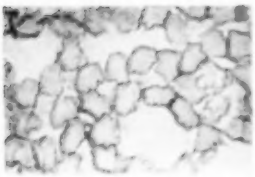
(i) Efficiency in caustic alkaline solutions
(ii) Stability in caustic alkaline solutions
(iii) Non-reactivity with the leuco compounds of vat dyes
(iv) Solubility in cold solutions of high sodium ion content

Contrary to previous statements [5], Perminal BX is the best product so far tested, but its low cold solubility, which would prevent the maintenance of a homogeneous solution during long runs, limits its value for bulk use.

Extreme variations in running speed, giving dyeing times from 2 sec. to 6 sec., were shown not to influence the shade or fastness properties of vat dyeings produced by the molten metal process, provided that the concentration of dye in the feed liquor did not exceed 150–200 g. of single-strength dye per litre. Above this limit a progressive loss in colour yield at the higher running speed was observed. No limitations in the depth of dyeing obtainable were imposed by the solubility of the leuco vat dye. Feed liquors containing 300 g. Caledon Blue RCS per litre have been applied, at the lowest running speed available in the laboratory machine (i.e. with 6 sec. dyeing time), and gave speck-free dyeings. No evidence of leuco dye decomposition is encountered provided that the reducing agent concentration is not greatly increased over the quantities specified by the above graph.

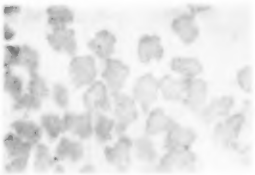
Photomicrographs were made of fibre cross-sections of cotton and viscose rayon which had been vat-dyed on the laboratory molten metal machine for periods of 2 and 7 sec. (total time of immersion in dyebath and molten alloy). A selection of the viscose rayon sections are reproduced in Fig. 3–8. It will be seen that a rapidly diffusing dye like Caledon Golden Yellow GK gave complete fibre penetration in 7 sec. Caledon Jade Green XN and Caledon Brilliant Orange 4RN, dyes

Photomicrographs of Viscose Rayon dyed on the Molten Metal Machine



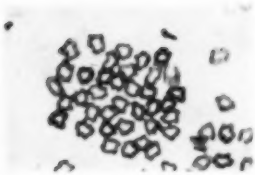
2 sec.

FIG. 3 Caledon Golden Yellow GK



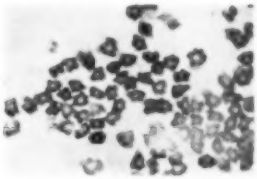
7 sec.

FIG. 4



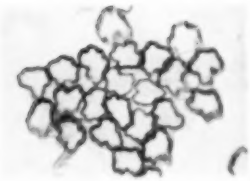
2 sec.

FIG. 5 Caledon Jade Green XN



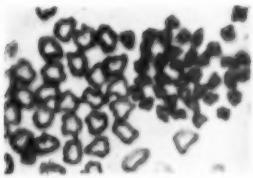
7 sec.

FIG. 6



2 sec.

FIG. 7 Caledon Brilliant Orange 4RN



7 sec.

FIG. 8

which possess respectively moderate and low rates of diffusion when measured by traditional procedures [7], show pronounced evidence of "ring dyeing" after both 2 and 7 sec. In spite of ring dyeing of this nature, dyeings produced from dyes with exceedingly low rates of diffusion, e.g. Caledon Khaki 2G, gave equal wet fastness to corresponding dyeings produced on the jig, and thus it may be postulated that the vat dyes can be completely fixed by adsorption on to the available surface sites in the cellulose without diffusing to the fibre centre.

Uniform distribution of dye between cotton and viscose rayon was obtained irrespective of the union dyeing properties of the vat dye in traditional methods. Dyes, such as Caledon Olive R, which intrinsically give different shades on cotton and viscose rayon are, of course, still unsuitable for the production of solid shades by the molten metal process.

The penetration of dye into the fabric structure obtainable in the laboratory machine was superior to that obtained by normal jig dyeing but was inferior to that realised by pigment padding followed by jig reduction. It was noticeable with heavy fabrics, or materials made from high-twist yarns, that the penetration of any given dye into the fabric structure was related to its levelling properties in conventional systems. Thus the high-affinity Method 1 dyes gave an inferior surface appearance compared with the more "level dyeing" Methods 2 and 3 types. Moreover, it was not possible to obtain a universal improvement in the penetration properties of Method 1 dyes by addition to the feed liquor of non-ionic vat-dye retardants, such as Lissapol N and Dispersol VL. With "difficult" fabrics, therefore, the only method of obtaining satisfactory penetration was to pigment-pad in the normal way and then, with or without intermediate drying, to develop through the molten metal machine. A study of the factors affecting such a process was therefore undertaken.

3.2 PIGMENT-PAD → DRY → DEVELOP THROUGH THE MOLTEN METAL MACHINE

(*3.21*) *Preliminary Evaluation*

The range of homogeneous Caledon dyes was applied to a bleached mercerised cotton poplin using the above sequence. The pigment-padding liquor contained per litre—

100 g. ... Single-strength dye
10 c.c. ... Calsolene Oil HS

The fabric was padded, with an expression of 100%, through this suspension maintained at 50–60°C., and air-dried. Portions of each padding were then developed as follows—

(1) Developed, with an 8 : 1 liquor : goods ratio for 45 min. at the specified jig dyeing temperature for the individual dye

(2) Run into the laboratory molten metal machine with a feed liquor containing—

7·5 g. ... Caustic soda flake
15 g. ... Sodium hydrosulphite

The fabric was then stopped in contact with the metal alloy for 30 sec.

(3) Developed through the laboratory molten metal machine with feed liquor as (2) above and 5·5 sec. contact with the molten metal.

Navy blues and blacks were padded with 200 g. single-strength dye per litre and developed as above, except that the feed liquor contained per litre—

12·5 g. ... Caustic soda flake
25 g. ... Sodium hydrosulphite

The purposes of these experiments were as follows—

(1) To represent full-time reduction under jig dyeing conditions

(2) To represent full-time reduction under high-temperature conditions, with a feed liquor

TABLE II

Colour Value for Rapid Reduction (5·5 sec. contact with molten metal) compared with Control (30 sec.)

Caledon Paste Fine Dye	Colour Value (% weaker than control)	Group
Golden Yellow GK 200 ...	5% strong	1
Yellow GN 200	5	1
Yellow 5GK 150	25	2
Yellow 5G 150	25	2
Yellow 4GS	20	2
Yellow 2RS	10	1
Brilliant Orange 4RNS ...	40	3
Brilliant Orange 6RS ...	5% strong	1
Gold Orange G 200 ...	20	2
Gold Orange 3G 200 ...	40	3
Orange 2RTS	20	2
Brown 3G 150	30	3
Brown RS	40	3
Dark Brown 3RS ...	35	3
Dark Brown 2GS	40	3
Dark Brown 6R 200 ...	30	3
Khaki 2G 150	25	2
Orange Brown 2G 150 ...	20	2
Brilliant Red 3BS ...	30	3
Pink RL 200	30	3
Red 2GS	30	3
Red 5GS	40	3
Red X5B 200	50	3
Brilliant Purple 4R 150 ...	50	3
Brilliant Violet 3BS ...	40	3
Brilliant Violet RS ...	25	2
Red Violet 2RNS ...	Equal	1
Violet XBNS	25	2
Blue GCPS	35	3
Blue RCS	> 50	3
Brilliant Blue 3GS ...	40	3
Brilliant Blue RN 150 ...	50	3
Dark Blue GS	50	3
Dark Blue 2R 150 ...	50	3
Navy Blue 2RS	40	3
Green 2BS	40	3
Green 7G 200	15	2
Green RCS	> 50	3
Jade Green 2G 200 ...	20	2
Jade Green XN 300 ...	25	2
Olive DS	35	3
Olive RS	50	3
Olive Green B 200 ...	40	3
Direct Black AC 150 ...	50	3
Direct Black RS	40	3
Direct Black GS	50	3

containing the quantities of reducing agents required for leuco dyeing the same depth (cf. Fig. 2).

It was subsequently found that the differences between dyeings (1) and (2) were slight, and pattern (2) has therefore been used as control.

(3) To represent rapid reduction, again with a feed liquor containing the quantities of reducing agents required for leuco dyeing the same depth.

The results of this series of experiments are recorded in Table II. The strength assessments were estimated visually by two independent observers.

The dyes have been arbitrarily divided into three groups according to the colour loss obtained with 5-5 sec. alloy contact compared with 30 sec. alloy contact. Group 1 contains 5 dyes showing a colour loss of 0–10% inclusive; Group 2 contains 12 dyes showing a colour loss of 10–25% inclusive; and Group 3 contains 29 dyes which show a colour loss greater than 25%.

The implication of these preliminary results was, clearly, that the majority of Caledon dyes could not be applied by pigment-padding followed by reduction through the laboratory molten metal machine to give acceptable tinctorial value. Either by increasing the reduction-fixation period or by padding with the acid leuco compound instead of the pigment vat dye this difficulty could be circumvented. Neither approach, however, is very attractive, as the former lowers the production rate and the latter presents difficulties in the preparation of vat acid dispersions at the high concentrations required for padding.

A re-examination of the process—pigment pad, dry, develop through the molten metal machine—was therefore undertaken with a view to eliminating the colour losses observed. The following factors were examined—

3.22 Concentration of reducing agents in the feed liquor

3.23 Addition of wetting agents to the feed liquor

3.24 Particle size of the pigment vat dye

3.25 Use of reduction accelerators

3.26 Summation effects.

(3.22) *Reducing Agent Concentration*

The effect of increasing the concentration of reducing agents in the reduction feed liquor up to four times that required in the leuco dyeing process was examined at various depths of dyeing with Groups 2 and 3 dyes (see Table II). With the majority of the dyes examined, irrespective of the depth of dyeing, an increase in the concentration of caustic soda and sodium hydrosulphite in the reduction liquor brought about a marked increase in the colour yield obtained. The optimum concentration of reducing agents for the development of pigment paddings is twice that used in leuco dyeing to the same depth. Any further increase in the reducing agent concentration is either without effect or decreases the ultimate colour yield, depending upon the behaviour of individual dyes.

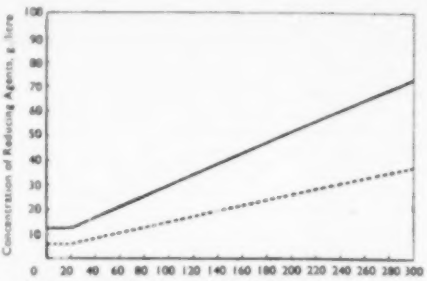


FIG. 9—Reduction of Pigment Paddings (with intermediate drying)

Fig. 9 shows the optimum composition of the reduction feed liquor over a range of concentrations of single-strength Caledon Paste Fine dye in the pigment-padding liquor when using a pad-mangle expression of 100%.

(3.23) *Addition of Wetting Agents*

As, in the preliminary experiments, Calsolene Oil HS was added to the pigment-padding liquor, and was dried into the cloth before development through the molten metal machine, no further wetting agent was added to the reduction feed liquor. Complete and rapid rewetting of both dye and fabric during passage through the feed liquor is, however, essential for rapid reduction and fixation of the padded dye, and therefore the use of wetting agents as additions both to the padding liquor and to the feed liquor was evaluated.

It was found that the addition of wetting agents to the pigment-padding liquor gave a reduction in the ultimate colour yield. This was initially attributed to the retarding effect of the wetting agent on the rate of reduction of the vat dye. This was disproved, however, in the case of Calsolene Oil HS by Marshall and Peters, who measured the rate of reduction of Caledon Blue RC and Caledon Navy Blue 2R at 60°C. with and without the addition of Calsolene Oil HS (10 c.c./litre). The technique used has been described in detail elsewhere [8]; the results are recorded in Table III.

TABLE III

Caledon Dye	Addition	Time of Half Reduction (sec.)
Blue RC	—	85
	Calsolene Oil HS	50
Navy Blue 2R ...	—	30
	Calsolene Oil HS	20

Ultimately it was shown that the addition of Calsolene Oil HS to the padding liquor gave decreased tinctorial value mainly by reducing the pick-up of the padding liquor, as shown in Table V.

This rather surprising effect has been observed by Clark [9], who also obtained a similar reduction

TABLE IV

Calsolene Oil HS in Pad Liquor (c.c./litre)	Pick-up (% on dry weight)
0	84·1
1	84·1
2·5	83·8
5	83·5
10	81·6
20	79·6

in uptake by raising the temperature of the pad liquor.

The improved penetration of dye into the fabric structure which resulted from the addition of Calsolene Oil HS to the padding liquor also contributed to the loss in tinctorial value observed.

Taking these facts into account, a wide range of wetting agents were evaluated as padding oils for use in this continuous process. No significant differences were encountered, however, in the abilities of individual products to affect the fixation of the absorbed dye.

The addition of wetting agent to the reduction feed liquor gave some slight improvement in the ultimate colour yield. The effect varied widely from one fabric to another (see § 3.26), but the individual products tested showed very little variation in their weight-for-weight efficiency for this purpose. Products such as Dispersol AC, which were shown to assist in wetting out vat dye powders in caustic soda–sodium hydrosulphite solutions, were without effect.

(*3.24*) *Particle Size of Pigment Vat Dye*

The difficulty of obtaining good tinctorial yields when using the molten metal machine for the development of pigment paddings is probably due to the fact that during the passage of the cloth through the machine itself two processes must be completed—

(i) Reduction of pigment-padded dye

(ii) Fixation of the reduced dye.

In the leuco dyeing process, stage (i) is largely completed during the passage of the dye liquor through the preheater, and it is known that stage (ii) can be effected very rapidly. The reduction of the pigment-padded dye would therefore appear to be the rate-controlling factor. This view is largely substantiated by the general, if not exact, correlation between the colour loss obtained in short-time reduction under the conditions given in § 3.1 and the rate of reduction of the individual vat dyes as measured by Marshall and Peters[8] (Table V).

TABLE V

Caledon Dye	Colour Loss (%) with 5·5 sec. Metal Contact	Time of Half Reduction at 40°c. (sec.)
Yellow GN	5	5
Gold Orange G ...	20	25
Yellow 4G	20	114
Brilliant Violet R ...	25	77
Jade Green XN ...	25	145
Pink RL	30	690
Red 5G	40	996
Navy Blue 2R ...	40	121

Caledon Navy Blue 2R represents an outstanding and unexplained anomaly.

Factors which would increase the rate of reduction of the pigment vat dye would therefore be of obvious value in this process. It was expected that the particle size of the pigment vat dye would exert a considerable influence on its reduction characteristics. This was disproved, however, both by Marshall and Peters[8] and in experiments on the laboratory molten metal machine with size fractions of Caledon Gold Orange G as shown in Table VI.

TABLE VI

Particle Size (μ)	Time of Half Reduction at 40°c. (sec.)	Percentage of Padded Dye fixed * after— 5 sec.	7 sec.	16 sec.
1–3	68	78	89	95
< 0·5	283	66	78	90

* Compared by development through the laboratory molten metal machine with the reduction–fixation times indicated; the dye was extracted quantitatively by the method of Abramovitch[18].

The insignificance of particle size differences, over the range encountered with dyes of pigment-padding quality, was confirmed in a series of experiments with a wider range of dyes. The filtration test described by Hampson[11] was employed as a criterion of the aqueous dispersibility of the vat dye used in the preparation of the padding liquor.

(*3.25*) *Reduction Accelerators*

A search was made for products which would accelerate the rate of reduction of anthraquinonoid vat dyes. Of a wide range of compounds tested anthraflavic acid (2:6-dihydroxyanthraquinone) was the most effective *. The greatest improvement in colour-yield was obtained by adding the accelerator to the pigment-padding liquor in the form of its disodium salt, i.e. 100 parts of anthraflavic acid dissolved with 34 parts of caustic soda flake. Irrespective of the depth of dyeing the optimum concentration of anthraflavic acid in the pad liquor was 0·8–1·6 g./litre, no further improvement in colour fixation being achieved by a further increase in the concentration of accelerator.

The action of anthraflavic acid as an accelerator varies widely from dye to dye, as shown in the experiments indicated in Tables VII and VIII.

TABLE VII

		Caledon Red X5B	Caledon Navy Blue 2R
PAD LIQUOR			
Dye (single strength), g./litre		100	200
Calsolene Oil HS, c.c./litre...		10	10
Anthraflavic acid, g./litre...	(*a*)	0	(*a*) 0
	(*b*)	0·8	(*b*) 0·8
DEVELOPING LIQUOR			
Caustic soda (flake), g./litre		15	26
Sodium hydrosulphite, g./litre		30	52
Calsolene Oil HS, c.c./litre...		5	5

The paddings were dried in the hot flue before development through the machine.

The running speed was varied to give reduction–fixation periods of 2, 6, 15, and 30 sec. in different

* Patent application pending.

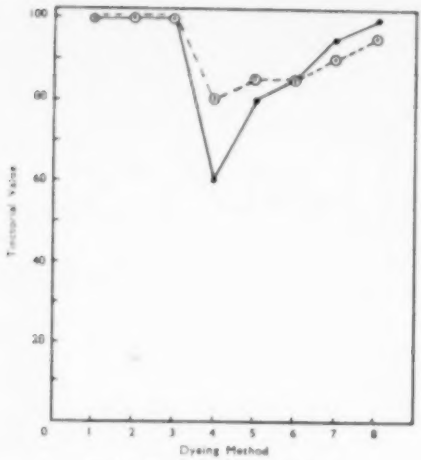


FIG. 10—Bleached Cotton Duck (Light)

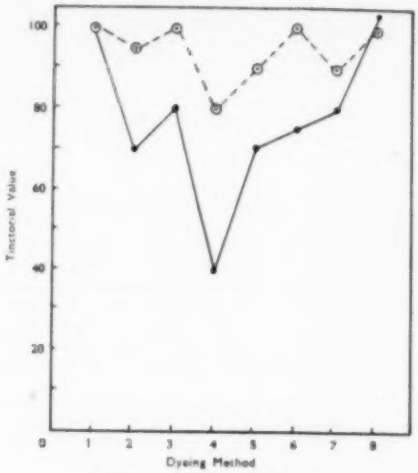


FIG. 11—Mercerised Cotton Poplin

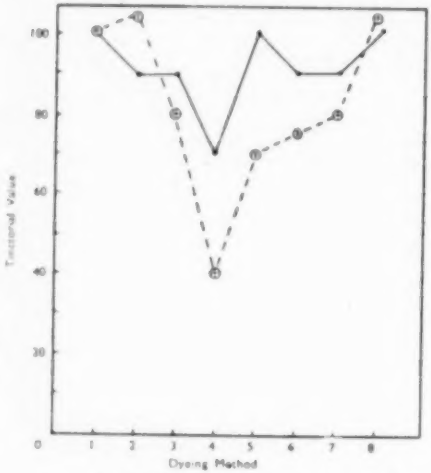


FIG. 12—Caustic-shrunk Dress Linen

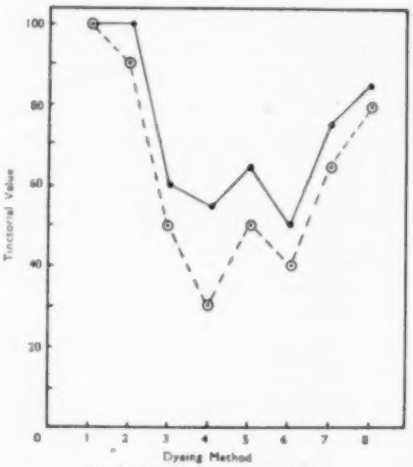


FIG. 13—Heavy Spun Viscose Rayon

—●— Caledon Blue RC
- - ⊗ - - Caledon Brown R

experiments. After oxidation and soaping, the vat dye was extracted quantitatively by the Abramovitch method[10].

TABLE VIII

Caledon Dye	Anthraflavic Acid in Pad Liquor	Padded Dye (%) fixed after— 2 sec.	6 sec.	15 sec.	30 sec.
Red X5B	(*a*) Without	20	60	80	95
	(*b*) With	57	95	94	95
Navy Blue 2R	(*a*) Without	68	74	86	88
	(*b*) With	63	74	84	85

Although the addition of anthraflavic acid to the pad liquor has a marked effect on the subsequent rate of fixation of Caledon Red X5B, it exerts no positive action with Caledon Navy Blue 2R.

(3.26) *Summation Effects*

Three of the factors examined, viz.—

(*a*) Use of increased concentrations of reducing agents in the reduction feed liquor

(*b*) Addition of wetting agent to pigment-padding and reduction liquors

(c) Employment of anthraflavic acid as a reduction accelerator

were shown individually to give improved tinctorial yields. The effect of combining these factors was therefore assessed collectively with Caledon Brown R and Caledon Blue RC with a variety of fabrics (Table IX).

TABLE IX

Fabric	Weight (oz./sq.yd.)	Ends (per inch)	Picks (per inch)
Light-weight bleached cotton duck	9	56	32
Bleached mercerised cotton poplin	3	148	76
Caustic-shrunk dress linen ...	6	48	32
Staple viscose rayon	9	29	26

Lengths of each fabric were padded through a suspension at 60°c. containing per litre—

A 100 g. ... Single-strength dye
10 c.c. ... Calsolene Oil HS

B 100 g. ... Single-strength dye
0·8 g. ... Anthraflavic acid (as disodium salt)
10 c.c. ... Calsolene Oil HS

The paddings were then dried in the hot flue, and portions developed in the following manner—

1. Padding A reduced under jig development conditions in an 8 : 1 liquor : goods ratio for 30 min at 50°c.
2. Padding B reduced as 1.
3. Padding A developed through the laboratory molten metal machine with a reduction–fixation period of 30 sec. using a feed liquor containing per litre—
   7·5 g. ... Caustic soda flake
   15 g. ... Sodium hydrosulphite
   These are the concentrations of reducing agents used in the normal leuco dyeing process for this depth of shade. Patterns 1, 2, and 3 therefore represent "controls" produced by a variety of methods.
4. Padding A developed through the laboratory molten metal machine as 3 but with a reduction–fixation period of 6 sec. This corresponds to the conditions used in the "Preliminary Evaluation" (§ 3.21).
5. Padding A developed through the laboratory molten metal machine with a reduction–fixation period of 6 sec. using a feed liquor containing per litre—
   15 g. ... Caustic soda flake
   30 g. ... Sodium hydrosulphite
   A comparison of patterns 4 and 5 therefore shows the effect of increasing the concentration of reducing agents in the feed liquor.
6. Padding A developed as 5 but with the addition of 5 c.c. Calsolene Oil HS per litre of feed liquor. A comparison of 5 and 6 shows the effect of adding Calsolene Oil HS to the feed liquor in the absence of accelerator.
7. Padding B developed as 5. A comparison of patterns 5 and 7 therefore shows the effect of the accelerator.
8. Padding B developed as 6. The three beneficial factors (viz. the increased reducing agent concentration and the incorporation of wetting agent in the feed liquor together with the addition of anthraflavic acid to the padding liquor) have been combined. Pattern 8 therefore represents the preferred method of development.

After development, the patterns were oxidised and soaped discontinuously but simultaneously. The relative tinctorial values, taking pattern 1 as a control representing 100% fixation, were then assessed visually by two independent observers. The results are recorded graphically in Fig. 10–13.

It will be seen that the fixation of dye obtained under any given development conditions varies widely from one fabric to another. This is very obvious when the relative fixation obtained with Caledon Brown R and Caledon Blue RC on the cotton fabrics is compared with that obtained on the linen and staple viscose rayon. Similarly the variants in the method of development have different effects with different fabrics. For example, the addition of Calsolene Oil HS to the feed liquor (cf. 5 and 6) gave an improved colour yield in four cases and a decreased colour yield in four cases.

However, in all cases the combination of the three beneficial factors gave the best dye fixation obtained by short-time reduction in the laboratory molten metal machine.

TABLE X

Caledon Dye	Gain in Strength by Preferred Method (%)	Loss in Strength by Preferred Method compared with 30 sec. Reduction (%)
Brilliant Orange 4RN	0	10
Gold Orange 3G ...	15	25
Brown 3G	10	25
Brown R	15	5
Dark Brown 3R ...	20	30
Dark Brown 2G ...	10	25
Dark Brown 6R ...	25	25
Brilliant Red 3B ...	0	15
Pink RL	25	5 stronger
Red 2G	10	15
Red 5G	5 weaker	30
Red X5B	45	5
Brilliant Purple 4R...	5	20
Brilliant Violet 3B ...	50	Equal
Blue GCP	10	20
Blue RC	20	Equal
Brilliant Blue 3G ...	25	Equal
Brilliant Blue RN ...	10 weaker	50
Dark Blue G ...	10	30
Dark Blue 2R ...	10	20
Navy Blue 2R ...	10 weaker	50
Green 2B	10	10
Green RC	40	10
Olive D	0	5
Olive R	5	20
Olive Green B ...	5	10
Direct Black AC ...	0	30
Direct Black R ...	0	25
Direct Black G ...	0	30

In order to obtain a more comprehensive assessment of the effect of anthraflavic acid, those dyes placed in Group 3 (see Table II) were re-examined using (*a*) the development method employed with pattern 6 in the foregoing series, and (*b*) the preferred method of development (8 in the above series). The light-weight cotton duck cloth was used in these experiments. The results are recorded in Table X.

Thus the preferred method of development gives a significant improvement in colour yield in many instances and significantly extends the colour range available for this process. It is, however, a palliative and not a universal cure.

3.3 Pigment Pad (Wet) → Develop through the Molten Metal Machine

It is possible to omit the intermediate drying stage between pigment padding and developing, but it is then necessary to employ the maximum pressure at the padding stage to ensure the maximum possible pick-up of the reduction feed liquor. Even so a further increase in the reducing agent concentration, from 1½ to 2 times that indicated in Fig. 9, is essential to ensure dye fixation. In general very similar colour yields are obtained by "wet" and "dry" development, although variations, usually in favour of the "wet" development, are encountered from one fabric to another. The addition of anthraflavic acid to the pad liquor and the incorporation of a wetting agent in the feed liquor are necessary to obtain an acceptable colour yield with many dyes. The differences in penetration occasioned by the omission of drying between padding and development are of a minor order. Although the better effect can be obtained with intermediate drying, the difference is probably not sufficient to warrant the inclusion of such a costly intermediate process. This can be decided by individual processors only in experiments with their own particular fabrics.

The omission of the drying stage introduces shade-matching difficulties. Furthermore, the higher concentration of reducing agents used in the feed liquor for the wet process may have an adverse effect on any "topping" dye incorporated in the reduction feed liquor.

(4) Conclusions

The implications of this evaluation, which, it must be emphasised, has been carried out on *laboratory* apparatus, are as follows—

The leuco dyeing process is technically an ideal continuous vat dyeing method yielding results equal, and in many respects superior, to conventional jig dyeings, with the minimum of operational difficulties. Its only limitation lies in the dyeing of heavy or tightly woven fabrics, where difficulties are encountered in obtaining adequate dye penetration into the fabric structure.

The latter difficulty can be overcome by prior pigment padding followed, with or without intermediate drying, by development through the molten metal machine. The laboratory evaluation of this sequence has shown that full reduction and fixation of the vat dye, in the limited time of immersion in the molten alloy, are difficult to achieve in certain instances. The details of the behaviour of the various dyes recorded herein cannot be taken as exact, however, in view of the known variations observed with different fabrics. By modification of the composition of the pad liquor and the reducing feed liquor coupled with dye selection, however, adequate reduction and fixation of the padded dye can be achieved with approx. 6–6·5 sec. in the molten alloy at 95–100°c.

* * *

Due acknowledgment must be made to Messrs. Standfast Dyers & Printers Ltd., Lancaster, for encouraging the publication of this technical information.

Imperial Chemical Industries Ltd.
Dyehouse Laboratories
Hexagon House
Manchester 9

References

[1] Williams, S. H., *Amer. Dyestuff Rep.*, **40**, P 461–P 468 (1951).
[2] Boardman, *J.S.D.C.*, **66**, 397–405 (1950).
[3] Hannay and Kilby, *BP* 620,584.
[4] Hannay and Kilby, *BP* 655,415.
[5] Speke, *Färgeriteknik*, **7**, 147 (1951).
[6] ICI Dyestuffs Division, *Technical Circular*, "Vat Dyeing — the Standfast Molten Metal Process".
[7] Boulton and Morton, *J.S.D.C.*, **55**, 481 (1939).
[8] Marshall and Peters, *ibid.*, **68**, 289 (Aug. 1952).
[9] Clark, *Calco Technical Bulletin* No. 822.
[10] Vickerstaff, *The Physical Chemistry of Dyeing* (Edinburgh: Oliver & Boyd, 1950), p. 48.
[11] Hampson, *J.S.D.C.*, **67**, 369 (1951).

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents

The Measurement of Damage produced by Treatment of Wool with Solutions of Hydrogen Peroxide

The Editor

Sir,

In a study of the bleaching of wool with hydrogen peroxide, it became necessary to assess the degradation produced during the oxidation. For this purpose, the method described by Speakman[1] was used, and several interesting observations have emerged from the preliminary work. The method for measuring damage consists in determining the work required to stretch fibres to 130% of their length to calibrate them, then submitting them to the treatment being investigated, and finally redetermining the work necessary to stretch the fibres 30%. The percentage reduction in work to stretch the fibres 30% (% R.W.) is considered to be an estimate of damage. It is usual to select fibres of approximately the same diameter for measurements of this type, but the results which have been obtained while studying the action of

hydrogen peroxide on wool show that this fibre selection is extremely important, for the diameter greatly affects the value obtained.

Calibrated fibres of various diameters were immersed in hydrogen peroxide solutions maintained at constant temperature for various lengths of time. After removing the excess reagent by washing, the load–extension characteristics of the fibres were redetermined and the % R.W. calculated. The composition of the hydrogen peroxide solutions and a summary of the results are given in the table. The pH was adjusted by addition of ammonia.

Conditions of Treatment			Fibre Diameter (μ)	% R.W. after Treatment for (min.)—		
Initial H_2O_2 Concn. (vol.)	pH	Temp. (°C.)		15	60	120
3·97	9·80	49·2	26·1	—	22·4	—
			26·4	+4·3	—	—
			27·4	—	—	45·0
			29·4	—	22·2	—
			29·7	2·4	—	—
			34·6	1·3	—	—
			37·6	—	21·3	39·5
			39·6	—	—	29·6
			43·3	—	12·8	—
			44·9	5·6	—	—
			46·2	3·7	—	—
			46·6	—	16·1	—
			48·2	—	—	24·1
			49·2	—	18·1	—
			51·5	5·1	—	—
				150 min.		
6·44	9·55	49·5	22·8	69·4		
			29·4	55·2		
			37·0	51·0		
			43·8	38·9		
				159 min.		
9·83	9·58	50·0	23·4	Completely dissolved		
			28·4	Partly dissolved		
			37·3	Partly dissolved		
			41·8	76·1		

It is evident that the % R.W. is very dependent upon the diameter of the fibres, coarse fibres being less easily attacked than finer ones. Moreover, this difference increases with the severity of treatment. When the treatment is mild the difference is negligible, but treatment for 150 min. with 6·44-vol. hydrogen peroxide of pH 9·55 at 49·5°C. brings about an R.W. of 69·4% on fibres 22·8 μ. thick and of 38·9% on fibres 43·8 μ. thick. If the concentration of hydrogen peroxide is increased to 9·83 vol., fibres of diameter less than 37 μ. are dissolved, while those 41·8 μ. thick show a reduction in work of 76% after treatment for 159 min. It is interesting to note that Harris, Smith, and Frishman [2] have also shown that the elastic properties of coarse fibres are less readily affected by treatment with cold calcium hypochlorite solution for 30 min. at pH 1·6, although this is not unexpected in view of the rapid reaction between wool and chlorine. It follows, therefore, that, in order to apply the % R.W. technique for assessing the rate of degradation caused by hydrogen peroxide solutions, the diameter of the fibres used should lie within limits of 5 μ.

It has been found also that, if the values for % R.W. for fibres of a given diameter treated with peroxide solutions for various times are plotted as a function of the square root of the time, linear relationships are obtained. The slopes of these lines, i.e. $\Delta(\%\text{R.W.})/\Delta(\sqrt{t})$, may be used as a numerical indication of the rate of fibre degradation. At present these relationships have been regarded purely empirically, but they have proved useful in expressing and classifying the degrading action of various hydrogen peroxide systems.

Yours faithfully

G. Laxer

C. S. Whewell

Department of Textile Industries
University of Leeds

23rd May 1952

[1] Speakman, *J. Textile Inst.*, **38**, T 102 (1947).

[2] Frishman, Smith, and Harris, *Text. Research J.*, **16**, 160 (1946).

Orthophosphoric Acid in the Printing of Brentogen and Soledon Dyes

The Editor

Sir,

When Brentogen and Soledon dyes are printed alongside one another, a bath containing a mixture of acetic, formic, and oxalic acids, together with Glauber's salt, is commonly employed for wet development. It has now been shown that if the mixed acids are replaced by orthophosphoric acid, slightly better development of the Brentogen and Soledon dyes is obtained, and the system is simpler and more readily controlled should modifications be required to give enhanced development of either class of dye.

For the simultaneous development of Brentogen and Soledon dyes, it is recommended that the printed goods be immersed for 30 sec. in a bath at 90–95°C. (195–205°F.) containing 30 c.c. (¾ pint) orthophosphoric acid and 50 g. (½ lb.) calcined Glauber's salt per litre (gal.) of water. As in the case of the conventional mixed acid bath, these conditions represent a compromise, since optimum yields are obtained from Brentogens when the acid concentration is lowered and the Glauber's salt concentration greatly increased, and from Soledons when the acid concentration is raised and the Glauber's salt omitted. Optimum concentrations of the phosphoric acid bath for the two classes when printed alone are—

	Orthophosphoric Acid		Glauber's Salt	
	(c.c./litre)	(pint/gal.)	(g./litre)	(lb./gal.)
Brentogens	10	½	200	2
Soledons ...	50	¾	—	—

The time and temperature of immersion are the same as before.

Yours faithfully

A. G. H. Michie

Dyehouse Laboratories
Imperial Chemical Industries Ltd.,
Hexagon House
Manchester 9

26th May 1952

Notes

Proceedings of the Council

At a meeting of the Council held at the offices of the Society, 19 Piccadilly, Bradford, on 14th May 1952, the proceedings included the following items of interest—

MEMBERSHIP OF COMMITTEES—The review was continued of the membership of committees of the Society (*see* p. 238). It was resolved to invite Mr. E. Waters to serve on the Publications Committee, and to accept the resignation of Mr. F. Ashworth from the Committee on the Dyeing Affinity of Regenerated Cellulose.

SUMMER SCHOOL—It was reported that arrangements were well in hand and that over fifty applications had been received.

MEMBERSHIP—Sixteen applications for ordinary membership and one for junior membership were approved.

Meetings of Council and Committees June

Council—18th
Publications—17th
Colour Index Editorial Panel—27th
Fastness Tests Co-ordinating—17th
Diploma—25th
Reviews of Textile Progress—24th

Deaths

We regret to report the loss by death of Mr. C. E. P. M. Callebaut and Mr. G. Casson.

Diploma Committee

Council has set up a new committee, the purpose of which will be "to work out in detail a Diploma Scheme from the viewpoint of policy, including relations with other bodies, syllabuses, and administration". The names of those who have accepted Council's invitation to serve on the reconstituted Diploma Committee are listed on p. 238.

N. G. McCulloch, C.B.E.

Members of the Society will wish to join Council in congratulating Mr. N. G. McCulloch, Chairman of the British Cotton Industry Research Association, and principal guest at the Society's Annual Dinner this year, on the award of the C.B.E.

Terms and Definitions Committee

The Terms and Definitions Committee has the task of devising or recommending definitions of common technical and scientific terms widely used in the industries served by the Society. After the suggestions and criticisms of members of the Society have been taken into consideration, it is hoped that the definitions adopted, when taken together, may help to remove some of the ambiguities and inconsistencies associated with usages now current, many of which were established at a time when technical conditions and scientific knowledge were very different from those of the present day.

To this end it is possible that comprehensive definitions of some established terms may not be attempted, or that, on occasion, the use of seemingly obscure or redundant ones may be discouraged altogether. Wherever possible the definitions proposed will admit of both qualitative and quantitative treatments, with due regard to established practice both in the exact sciences and in other industries.

It is the intention to make these definitions, as they are approved by the Society through Council, authoritative for the Society's publications. In this way, by continuous example, the admitted inconsistencies of our present terminology may at length be removed, with benefit alike to readers at home and overseas.

Tentative Definitions

The Terms and Definitions Committee will welcome comments on the following tentative definitions—

15. UNION DYE

A dye or mixture of dyes which will yield a uniform dyeing on the fibre mixture for which it is devised.

16. UNION DYEING

Any operation involving the dyeing of union fabric (*see J. Textile Inst.*, **40**, P 47 (1949)) or of any textile material composed of a mixture of different fibres.

17. CROSS DYEING

A dyeing operation in which one fibre of a mixture fabric is dyed, the others remaining undyed or substantially unchanged in colour if predyed.

Reports of Sections for the Session 1951–52

HUDDERSFIELD SECTION

We have had a very successful session, all lectures being of a high standard, but as usual with the practical side predominating. The programme has ranged from a film showing the Standfast molten metal dyeing technique to a lecture on the manufacture and dyeing of felts, and from wool and modified wool to cotton and Ardil. This session we have had two very good lectures from two members of our own Committee—Mr. D. Hanson on *A Chemist in the Woollen Industry* and Mr. F. Jordinson on *Defective Colour Vision*. We have had one joint meeting with other Societies, viz. the lecture on felts by Mr. H. R. T. Ashworth, which was held jointly with the Huddersfield Textile Society.

The Seventh Annual Dinner was held at Heywoods' this year, and a record attendance achieved.

We have had no visits this winter session, but one is to be arranged very shortly.

Once again, I would like to express my thanks to all Officers and Committee Members for their help during the session. Without them the work of the Section could not go on in the very successful way it has done.

H. TURNER
Honorary Secretary, Huddersfield Section

LONDON SECTION

Once again, the London Section can report that the session 1951–1952 has been a successful one, a full series of lectures having been held which were well attended. We were fortunate enough to obtain the help of lecturers with high qualifications in their respective fields, and as a result, considerable interest was shown in the subjects discussed.

Although it was not possible for the usual lecture to be held in Luton this Spring, it is hoped that a lecture will take place there early in the Autumn.

The social side of the Section's activities was marked by the holding of a dinner-dance on February 29th. On this occasion a private room was used at the Criterion Restaurant, Piccadilly, 67 members and friends being present. This new venture proved very popular and it is the Section's intention to repeat the function in the future. As usual, the Annual General Meeting was followed by an informal dinner.

F. HARRISON
Honorary Assistant Secretary, London Section

MANCHESTER SECTION

Nine meetings have been held in Manchester this session, and an external meeting was organised in Bury. Attendances have been slightly higher than those of last session, averaging almost 100. Joint meetings have taken place with the Lancashire Section of the Textile Institute and the British Association of Managers of Textile Works, and a very successful evening symposium on "Package-dyeing" has been organised, as an experiment in this type of meeting.

We congratulate Mr. W. Kilby on receiving the Gold Medal of the Society for his work on the application of the molten metal process to continuous dyeing.

The Junior Branch, in spite of an almost static membership for the last three years, has had a successful session, holding four well attended meetings.

We again express our gratitude to the lecturers, and to Mr. F. Scholefield, the Manchester College of Technology, the North Western Gas Board (Manchester Undertaking), and the Bury Education Committee for accommodation.

Six committee meetings have been held during the session. In addition to its normal business, the Committee has undertaken negotiations which have led to the formation by Council of a committee to arrange a Printing Symposium in 1953.

Following the success of the Dance last year, a similar function was held in the Grand Hotel on 28th February 1952. On this occasion over 180 members and guests were present, including Mr. H. Jennison (Honorary Treasurer of the Society) and Mrs. Jennison.

The Knecht Memorial Prize has been won by Mr. H. B. Hallows, who was a student in the third-year higher university course in textile chemistry at the Manchester College of Technology.

The Section was privileged to be hosts for the second George Douglas lecture, which was given by Dr. R. Hill on 7th March 1952 before an audience of approx. 350.

MEMBERSHIP

	1951 (April 13th)	1952 (April 18th)
Ordinary Members	585	596
Junior Members	25	27
	610	623

The number of new members (33) has been largely offset by the abnormally high number of resignations (25).

We regret to record the death of the following members of the Section — F. Ashworth, J. Baddiley, S. Heap, J. T. Hodgson, C. C. Howis, F. J. Smith, L. Stanley, G. Ullmann, and T. S. Whittle.

A. S. FERN
Honorary Secretary, Manchester Section

MIDLANDS SECTION

It is pleasing to report continued progress in the Midlands Section; the quality and variety of the papers have been well maintained, and attendances have been well up to the level of previous sessions. In all, eight meetings were held, in Leicester (3), Nottingham (2), Loughborough (2), and Derby (1). The average attendance was 73. Five Committee meetings and several other subcommittee meetings were held, and were well attended by representatives from a scattered area.

A Ladies Evening in November took the form of a film show and buffet dance, and was very successful, while the dinner at Nottingham in February was voted the best yet. In fact, the social side of our activities assists strongly in welding the membership of the Section into a friendly whole; the result is that lecture meetings are seized upon as an opportunity for renewing acquaintances interrupted by distance and diversity of business interest. It is common to see the bulk of the attendance still grouped together an hour after the Chairman has closed the meeting.

Although it was feared that economic reasons might affect numerical strength, a small increase in membership has taken place—

New members		26
Transfers		8
Total		34
Less		
Resignations	4	
Transfers	9	
Deaths	2	
Total	15	
Net increase		19
Present membership		294

Representation of the Section on Council and various committees continues at a good level. At the moment of reporting, one such committee (with a natural preponderance of Midland members) is very busy with work on the Society's Summer School, to be held this year at Loughborough College. The Section has also had the honour of staging this year's Mercer Lecture.

The activity of the Section was well exemplified at its Annual General Meeting; the attendance was well over 100, and no less than nine nominations

were forthcoming for five seats on the Committee. Messrs. W. L. Langton, C. Mills, A. Hoult, H. Hockney, and A. Phillips retired under rule. Messrs. Langton and Mills were re-elected, together with Messrs. J. Saunders, J. Rayment, and W. Penn. The last-named resumes his activity for the Section after a two-year break, and we are happy to report his recovery from ill-health. We cannot let the retirement of Mr. Hoult pass without reference to his eighteen years of service on the Committee, we hope to see him back soon. Meanwhile, welcome to the two newcomers, who have always been enthusiastic members.

At a subsequent meeting, Mr. A. P. Kershaw was elected Chairman for a further term and Mr. S. R. Meadows became Vice-chairman.

We regret to report the deaths of Mr. W. Clarke of Kidderminster and Mr. C. S. Groves of Nottingham, both respected men in their particular districts.

We must also acknowledge the interest taken and help afforded by Officers of the Society and members of other sections; we have been very happy to see so many of them at our social functions and lecture meetings.

A. W. CARPENTER
Honorary Secretary, Midlands Section

NORTHERN IRELAND SECTION

The 1951–52 session has been regarded as satisfactory from every point of view. Six lecture meetings were held during the session, and it is pleasing to report that attendances were above average.

Membership has again shown an increase, and we are pleased to report that resignations which we expected from remotely situated members owing to the increase in annual subscription did not materialise.

The Annual General Meeting was held on 5th April 1952. Mr. D. A. Derrett-Smith was re-elected Chairman and Mr. J. Montgomery Vice-chairman. All other officers were re-elected, with the exception of two committee members—Dr. T. E. Ellison and Dr. B. C. Gee. These two members retired in accordance with Section Bye-laws, and their successors are Mr. H. Sharpe and Mr. J. Clarke.

The Annual Dinner was also held on 5th April 1952, when we had the pleasure of welcoming as our chief guests Colonel S. G. Haughton, D.L., and Dr. H. A. Thomas. We had a record attendance of 61 at this function, and the musical programme provided by well known local artistes was thoroughly enjoyed.

JAMES PORTER
Honorary Secretary, Northern Ireland Section

SCOTTISH SECTION

A happy and advantageous session has been concluded by the Section. During the session, seven meetings were held, all in Glasgow. The high standard of lectures has been maintained, and in arranging the programme the Committee endeavoured to cover as wide and interesting a field as possible. Attendance at lectures has been exceptionally good.

Membership of the Section showed a decline for the first time in several years, and it is hoped that efforts will be made by all to introduce new members during the current year.

The end of the session was marked by a visit to the Glenpatrick Carpet Works of Messrs. A. F. Stoddard & Co. Ltd. on the afternoon of Friday, May 9th. A party of over fifty attended and spent a very interesting and enjoyable afternoon.

The Annual General Meeting of the Section was held on Tuesday, March 18th.

Plans are well in hand for the 1952–53 session, and tentative arrangements have been made for a number of interesting papers.

Mr. D. B. F. McAndrew retires from the Chairmanship after two years, and this opportunity is taken of expressing our appreciation of his work for the Section and of extending a hearty welcome to his successor, Mr. R. D. Alexander. Mr. R. A. Peel was elected Vice-chairman and Messrs. A. R. Edge and W. G. B. Grant to fill Committee vacancies.

F. ATACK
Honorary Secretary, Scottish Section

WEST RIDING SECTION

Eight lecture meetings have been held in Bradford, two in Leeds, and a joint meeting with the Halifax Textile Society in Halifax. The Leeds meetings were very successful, having attendances of 62 and 74. The average attendance of the Bradford meetings has been 78, excluding the summer lecture, given by the visiting Americans, Dr. Milton Harris and Mr. A. G. Ashcroft, when the attendance exceeded the capacity of the room.

A very successful meeting of the Section, which took the form of a dinner, was held on 6th April 1951, when the Gold Medal of the Society was presented to Mr. H. Foster by Mr. F. Scholefield, President of the Society; during the same evening a presentation was made to Mr. and Mrs. Foster, on behalf of the Section, by Mr. E. A. Swift.

Other activities of the Section, namely the "Smoker" and Ladies Evening, have again been well supported by members.

The Committee have met on five occasions during the session, and I would like to thank Mr. C. O. Clark, our Chairman, and Members of the Committee for their considerable help during the session.

G. E. STYAN
Honorary Secretary, West Riding Section

A.A.T.C.C. 1952 Convention

A preliminary invitation has been published to contribute technical papers at the National Convention of the A.A.T.C.C., to be held in Boston, Mass., on 6–8th November 1952. The title and an abstract of the proposed paper should be sent as soon as possible to the Convention Technical Chairman, E. R. Kaswell, c/o Fabric Research Laboratories Inc., 665 Boylston Street, Boston 16, Mass., U.S.A., and if accepted the complete paper must be in his hands by the first week in September.

Third Canadian Textile Seminar

This will be held at Queen's University, Kingston, Ontario, on 11–13th September 1952, and will include papers on various aspects of dyeing and finishing. Registration forms for those wishing to attend are obtainable from the Textile Technical Federation of Canada, 1410 Guy Street, Montreal, Quebec.

International Textile Congress in Venice

An international congress on "Unity in the Textile Field" will be held in Venice, Italy, during 15–18th September 1952. Its work will be divided into two sections—social-economic and technical—the latter including papers on dyeing and finishing. Further details are obtainable from the Centro Internazionali delle Arti e del Costume at (until September 10th) Milan, via Borgogna 1, or (after September 10th) Venice, Palazzo Grassi.

International Congress on Analytical Chemistry

This will be held in Oxford during 4–9th September 1952. Among the subjects of papers to be presented at the congress are the establishment of pH standards, the polarography of tetrathionates, the colorimetry of indicators, and chromatography. The complete proceedings will be published subsequently in the *Analyst*. Further information is obtainable from the Honorary Secretary, R. C. Chirnside, Esq., c/o General Electric Co. Ltd., Research Laboratories, Wembley, Middlesex.

The History of Wool in Yorkshire Exhibition at Kirkstall Abbey, Leeds

An exhibition illustrating the history of wool in Yorkshire was opened on 26th April 1952 in the Norman Room, Kirkstall Abbey, Leeds, and will remain open daily from 1 p.m. to 6 p.m. until 31st August 1952. The exhibition, which is designed as a tribute to those Cistercian monks who founded the abbey 800 years ago, contains working examples illustrating the progress of spinning and weaving from the Bronze Age to the present day, old hand shears, and copies of medieval decorative fabrics. C O C

Kuralon—Polyvinyl Alcohol Fibre

A polyvinyl alcohol staple fibre is now being made at the rate of 10 tons per day by the Kurashiki Rayon Co. in Japan. In Japan it is known as "Vinylon", but for export it is sold as Kuralon fibre. C O C

Revised British Standard for Green Oxide of Chromium for Paints

This is now available as a separate publication (*BS* 318 : 1952, price 2s 0d). The technical requirements are practically unchanged, but the wording of the text and the methods of test have been correlated with those of other British standards for pigments for paints. The specification includes requirements for composition, residue on sieve, oil absorption value, colour, tone and staining power, matter volatile at 98–102°C., and matter soluble in water. Method of sampling and methods of test are given in an appendix. C O C

Overseas Science Students Association

The Overseas Science Students Association was formally instituted at a meeting in London on 19th March 1952, and about a hundred members have already joined. The proposal that such an Association should be formed was adopted at an earlier meeting on February 27th, when Sir Harold Spencer Jones, the Astronomer Royal, addressed a number of overseas science students at the Society for Visiting Scientists. The objects of the Association are to bring graduate science students from overseas into contact with the scientific life of Great Britain and to bring such students into contact with one another. It is affiliated to the Society for Visiting Scientists Ltd., where its meetings will be held. The Association proposes to fulfil its objects by arranging scientific meetings and visits to places of scientific interest and by other means. Further details can be obtained from P. Sen, c/o Society for Visiting Scientists Ltd., 5 Old Burlington Street, London W.1.

International Scientific Film Association 1952 Congress

This year's Congress is to be held in Paris from Tuesday, 23rd September, to Wednesday, 1st October 1952. Enquiries should be sent to the British Scientific Film Assocn., 164 Shaftesbury Avenue, London W.C.2. C O C

University of Southampton

University College, Southampton, has now been granted university status, and will be known in future as the University of Southampton. C O C

New Books and Publications

The Dyeing of Nylon Textiles

Imperial Chemical Industries Ltd., Dyestuffs Division. Pp. v + 163. Manchester, 1952. No price.

This book contains the collected information on every aspect of the dyeing of nylon and mixtures of nylon with other fibres previously presented in a smaller volume bearing the same title, a Technical Circular, and published lectures, etc. Thus chapters are devoted to the application of disperse and Solacet dyes, acid, direct, chrome and premetallised dyes, Brenthol combinations, and vat dyes; the dyeing of wool-nylon and other nylon mixtures, and hosiery dyeing. New material of special interest includes a chapter on the theory of the dyeing of nylon, which gives formulæ and graphical data and is of particular value to the student and the teacher. A final general survey summarises the position and the achievements to

date, indicates the major deficiencies and limitations in existing dyes and techniques, and suggests possible lines for further development.

C. B. STEVENS

Identification of Textile Materials

The Textile Institute. Third edition 1951. Pp. 94. Manchester: Textile Institute. Price, 10s. 6d.

This publication is a slightly enlarged reprint of the report of the Institute's General Technical Committee C published in October 1951 (*J. Textile Inst.*, **42**, s 25–s 116), and is an attempt to provide a practical guide to fibre identification in 94 pages. The subject is one which must inevitably interest all engaged in the many branches of the textile industry, regardless of what analytical facilities may be available to them. It is obvious that the same line of approach cannot be successfully adopted for both the foreman dyer and the textile chemist in the well equipped laboratory of a large organisation. Although this work is primarily of interest to the latter, the man with few facilities available has obviously been considered, as the detailed and careful description of the burning test shows.

The first twenty pages are devoted to a description of the general properties and methods of manufacture of various fibres and they contain a surprising amount of information, most of which is of direct interest to the textile analyst. In a work of this type, which cannot pretend to be comprehensive, it would seem essential to give adequate references to those subjects not fully dealt with. Hence, when we read on p. 4 that the reader is assumed to have the necessary experience and knowledge to use the microscope correctly, we expect at least a short list of general references on this subject.

The next 29 pages are devoted to a selection of analytical tables and explanatory notes on these. One table intended for dealing with the more common materials is given as an exact scheme of analysis to be followed closely, but it is noteworthy that, in connection with more comprehensive analysis or when using the microscope, this method is largely abandoned, and the resulting tables can best be described as lists of reactions to different tests. The experienced textile microscopist will devise his own procedure for identification rather than rely on a rigid analytical scheme. The possibilities of the finer techniques of microscopy do not seem to be fully recognised, with the result that there is a paucity of information on refractive indices of fibres. A table of these and suggested mountants for optically dissolving those fibres which are not too birefringent would be very useful.

The study of protein fibre scale structure could also have been emphasised more in view of the Sellotape half-embedding method, which has the virtue of extreme simplicity to recommend it. On the other hand, the page devoted to fibre density measurement by the density gradient method deserves mention as an extremely good introduction to a very useful method.

The remaining pages are devoted to a selection of fibre photomicrographs, which, it is rightly emphasised, are no substitute for experience in the microscopical examination of known fibres, but which, nevertheless, should be extremely useful.

In view of the scarcity of standard works on the subject and the increasing difficulties imposed by rapid modern developments, this book will certainly be welcomed by textile chemists.

J. C. BROWN
G. G. TAYLOR

A Text-book of Quantitative Inorganic Analysis
Theory and Practice

By Arthur I. Vogel. Second edition 1951. Pp. xxiii + 918. London: Longmans, Green & Co. Price, 48s. 0d.

This new edition appears in a new format having larger pages, which display the text to better advantage than did the first edition. The volume has been increased by 62 pages and by 71 new sections. The six chapters of the first edition are now increased to eleven by including very welcome chapters on potentiometric and conductimetric analysis, the polarograph (with constructional details for a hand-operated instrument), amperometric titrations, and micro-methods of quantitative analysis. Other notable additions include—controlled-cathode electrodepositions (with details for constructing the control apparatus), reduction with metals, applications of the Karl Fischer reagent, the use of Trilon B in determining the hardness of water, and irreversible indicators in iodate titrations. The sections on the use of vanadous and chromous solutions have been rewritten. A selected bibliography accompanies each chapter.

This edition is still primarily a book for the student, clear in its exposition and strong in its emphasis on fundamental bench-work and on a knowledge of the theoretical principles involved. Moreover, the student will acquire a good appreciation of the part played by instrumental methods in the expanding field of analytical chemistry. For their standardisation and development, most of these instruments, particularly in absorptiometry, require from the analyst still more ingenious applications of the chemical knowledge to be acquired at the bench. It seems scarcely possible to produce a book which is suitable at once for the student and the practising analyst: their requirements differ. Nevertheless, the analyst should have the book at hand because of its comprehensive picture of the developing subject and the probability that it contains information required to deal with some unusual problem.

The following minor points of criticism may be noted. "Conjugate" acid–base is preferable to "conjugated"; the former implies relationship, the latter, interaction. The substances CuI and CuCNS are probably better represented by these monomeric formulæ; the lattice of AgCN shows no obvious relationship to the acid $H[Ag(CN)_2]$. A Bunsen valve (p. 281) should be fitted to a round-bottom flask. The bromination of oxine takes time, and five minutes should elapse before potassium iodide is added. A band-width of 10–35 A. is not "of definite wavelength", and colour-filters do

Sandozol KB
Dyeing assistant especially suitable for producing homogeneous dyeings on union materials.
Protects woollen pieces from mechanical damage such as chafing marks.
Sandoz
PRODUCTS LTD.
BRADFORD
SANDOZ

"Liver me foot !
It's those d...* dyes you're using"

serisol DUSTLESS dyestuffs

Serisols for Acetate Rayon
Serinyls for Nylon

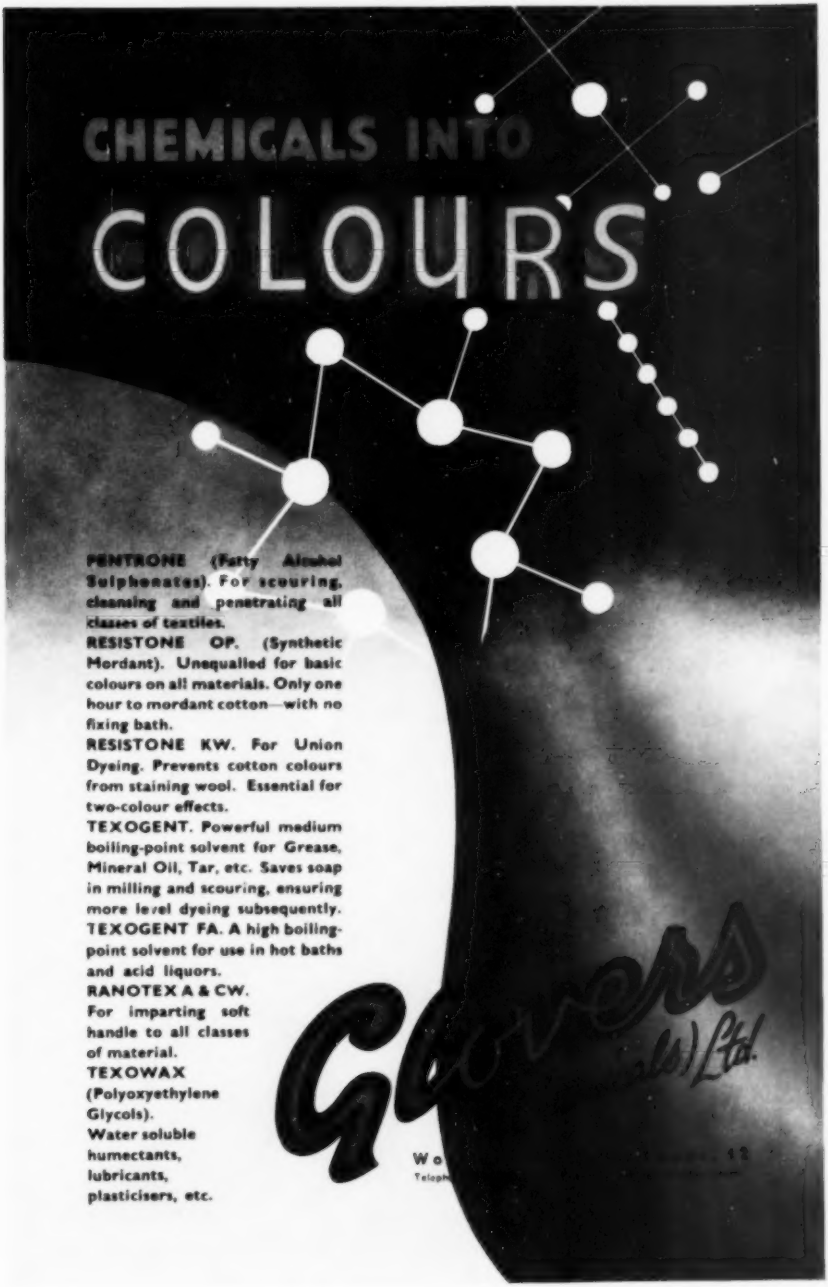
* "DUSTY"

THE YORKSHIRE DYEWARE & CHEMICAL COMPANY LIMITED

YDC

LEEDS

x xx 255


CHEMICALS INTO
COLOURS
PENTRONE (Fatty Alcohol Sulphonates). For scouring, cleansing and penetrating all classes of textiles.
RESISTONE OP. (Synthetic Mordant). Unequalled for basic colours on all materials. Only one hour to mordant cotton—with no fixing bath.
RESISTONE KW. For Union Dyeing. Prevents cotton colours from staining wool. Essential for two-colour effects.
TEXOGENT. Powerful medium boiling-point solvent for Grease, Mineral Oil, Tar, etc. Saves soap in milling and scouring, ensuring more level dyeing subsequently.
TEXOGENT FA. A high boiling-point solvent for use in hot baths and acid liquors.
RANOTEX A & CW. For imparting soft handle to all classes of material.
TEXOWAX (Polyoxyethylene Glycols). Water soluble humectants, lubricants, plasticisers, etc.
Glovers
Ltd.

CHANGE OF NAME

Previously we advertised and sold

our sodium sulphosuccinate

WETTING AGENT under the name of **AEROSOL O.T.**

—the name under which the product has been sold for many years in North America. We have decided in future to use

the name

MANOXOL O.T.

but please note—

the **QUALITY** will be **UNCHANGED**

MANOX

HARDMAN & HOLDEN LIMITED

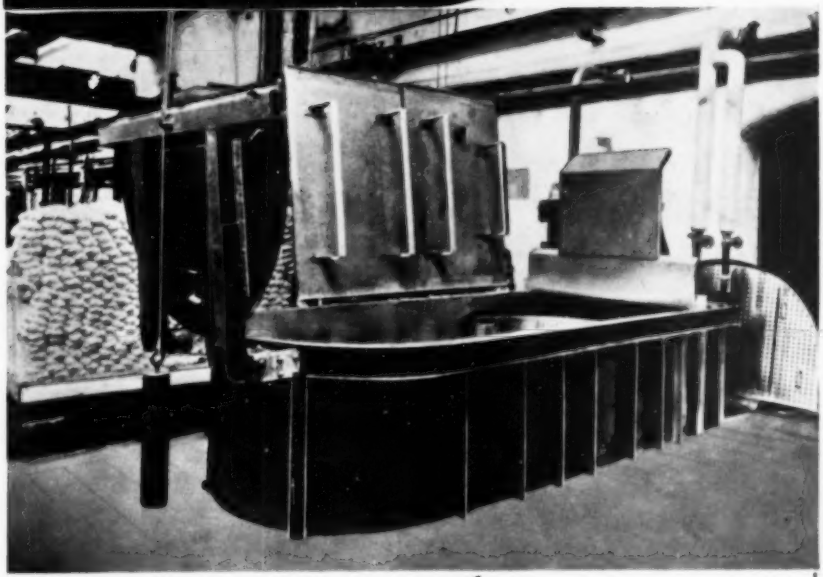
incorporating

MANCHESTER OXIDE CO. LTD. · MANOX HOUSE · MILES PLATTING · MANCHESTER 10.

Telegrams: OXIDE, MANCHESTER Telephone: COLLYHURST 1551 (10 lines)

Increase efficiency

—with Stainless Steel



Yarn Bleaching Machine

Stainless Steel equipment has meant a great technical advance in the Dyeing and Bleaching Industry. Ability to withstand the action of corrosive liquids and the ease with which the containers can be cleansed, make these machines first choice where long life and the highest quality results are essential.

Full information is contained in the Dyeing Bulletin, D.M.50 which may be obtained on request to:—

Metal Propellers

LIMITED

STAINLESS STEEL SPECIALISTS

74 Purley Way, Croydon, Surrey

Telephone: Thornton Heath 3011
Telegrams: Metaprops, Boophone, London

Telephone Sheffield 42051

ALCOPOL O

DI-OCTYL ESTER OF SULPHO-SUCCINIC ACID

UNIVERSALLY ACKNOWLEDGED
THE MOST EFFICIENT WETTING
PRODUCT

ALLIED COLLOIDS (MANUFACTURING) CO LTD
BRADFORD MANCHESTER LONDON

JR for Perfection IN SULPHUR COLOURS
SULPHOL VIOLET 2B
SULPHOL YELLOW 6G
The two most recent additions to our range
JR & Co LTD
JAMES ROBINSON & Co LTD
ANILINE DYE MANUFACTURERS HUDDERSFIELD ENGLAND
Telephone 314 335
Telegrams ROBINSON HUDDERSFIELD
AGENTS — SCOTLAND — Henderson Hogg & Co 17 Cadogan Street Glasgow C2 NORTHERN IRELAND AND EIRE — Mr F G Anderson 28 Exchange Street Belfast SWEDEN — A/B Nils Holmberg Halmstad 1 Sweden BELGIUM — Promotex Brussels AUSTRALIA — The Victorian Chemical Co Pty Ltd Melbourne EGYPT — Societe d'Avances Commerciales SAE Cairo DENMARK — The Stayers Co Copenhagen FRANCE — Seppic Paris SPAIN — Modaca Barcelona PORTUGAL — Weber & Co 82 Galeria do Paris 1 Oporto INDIA, PAKISTAN AND CHINA — D & J Fowler Ltd 86,88 Queen Victoria Street London EC4 NORWAY — Petter Endresen Postboks 353 Oslo FINLAND — A B Onerva Oy Tampere

Royal Horse Guards Officer Full Dress

Colour.... in industry

Quality and reliability in Dyestuffs are traditions at Clayton. In common with the British Army, we combine the lessons of long experience with the discoveries of to-day, and provide for all colour users the comprehensive facilities of our Service Department.

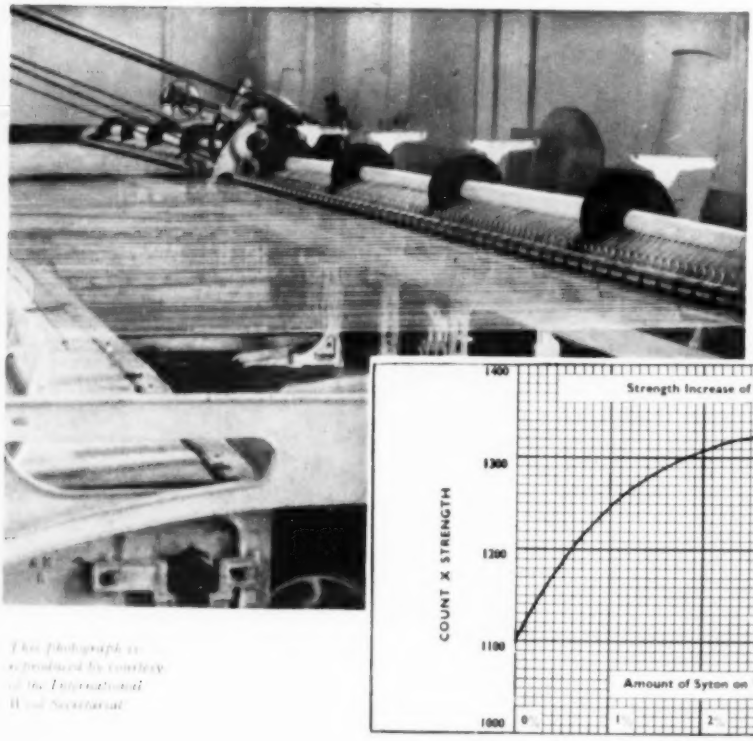
Clayton

Aniline Company Limited
CLAYTON : MANCHESTER 11
Telephone East 1341 (10 lines)

SOLE CONCESSIONNAIRES IN THE UNITED KINGDOM FOR CIBA LIMITED BASLE SWITZERLAND

QD

SEE THE EFFECT OF SYTON ON YARN STRENGTH!



This photograph is reproduced by courtesy of the International Wool Secretariat

Increased yarn strength with Monsanto SYTON W-20* means faster, cheaper production.

Monsanto SYTON W-20 is a remarkable product. The hundreds of mills in this country which have made use of Syton since its arrival in 1948 are evidence of its success. As an anti-slip agent in woollen and worsted spinning, it has brought about 10-20% greater yarn strength, resulting in fewer 'ends-down' and increasing production. It also permits reduction in twist, where required. It has saved time, labour and money by reducing breakages during process.

SYTON IS SO EASY TO APPLY!

Not least among the qualities of Syton W-20 is the fact that in most cases it can easily be fitted in with existing operations and processes, and does not entail the installation of extra equipment. And it does not affect the dyeing or finish of any material.
In the textile industry, the potentialities of Syton are enormous.
If you have not yet tried Syton W-20 in your mill, write now to Special Products Department, Monsanto Chemicals Limited. If you are already a satisfied user, be sure to keep in touch with Monsanto—for the latest news on other Monsanto developments for the textile industry.

MORE MONSANTO CHEMICALS FOR FINER TEXTILES:—

Santobrite*

Monsanto's preservative against mildew in textile sizes and finished fabrics. Santobrite (sodium pentachlorophenate) prevents mildew and similar growths on sized yarns or finished fabrics. It is especially suitable for most textiles. It enables larger batches of size to be mixed and kept, allows sized yarns to be stored damp and pliable without risk of mildew or discolouration. Applied in final wet finishing operation to preserve fabrics in transit and store.

Santomerse*

Monsanto's general purpose detergent for scouring, washing, wetting and levelling. Santomerse No. 1 is a general purpose synthetic detergent and wetting agent of the alkyl aryl sulphonate type. Recommended for all scouring and washing processes. Invaluable as a wetting and levelling agent in dyeing. Neutral, functions in hard water, without leaving insoluble deposits; suitable for use over a wide range of acid and alkaline conditions.

If you have a problem which chemicals can help to solve, consult Monsanto. Monsanto Chemicals serve every branch of the textile industry. For instance, there are two new Monsanto products—Syton 2-X for the spinning of rayon and cotton and the finishing of rayon and nylon—Stymer* S for the sizing of synthetic warps. If you are interested in these and other textile applications, write Special Products Sales Department.

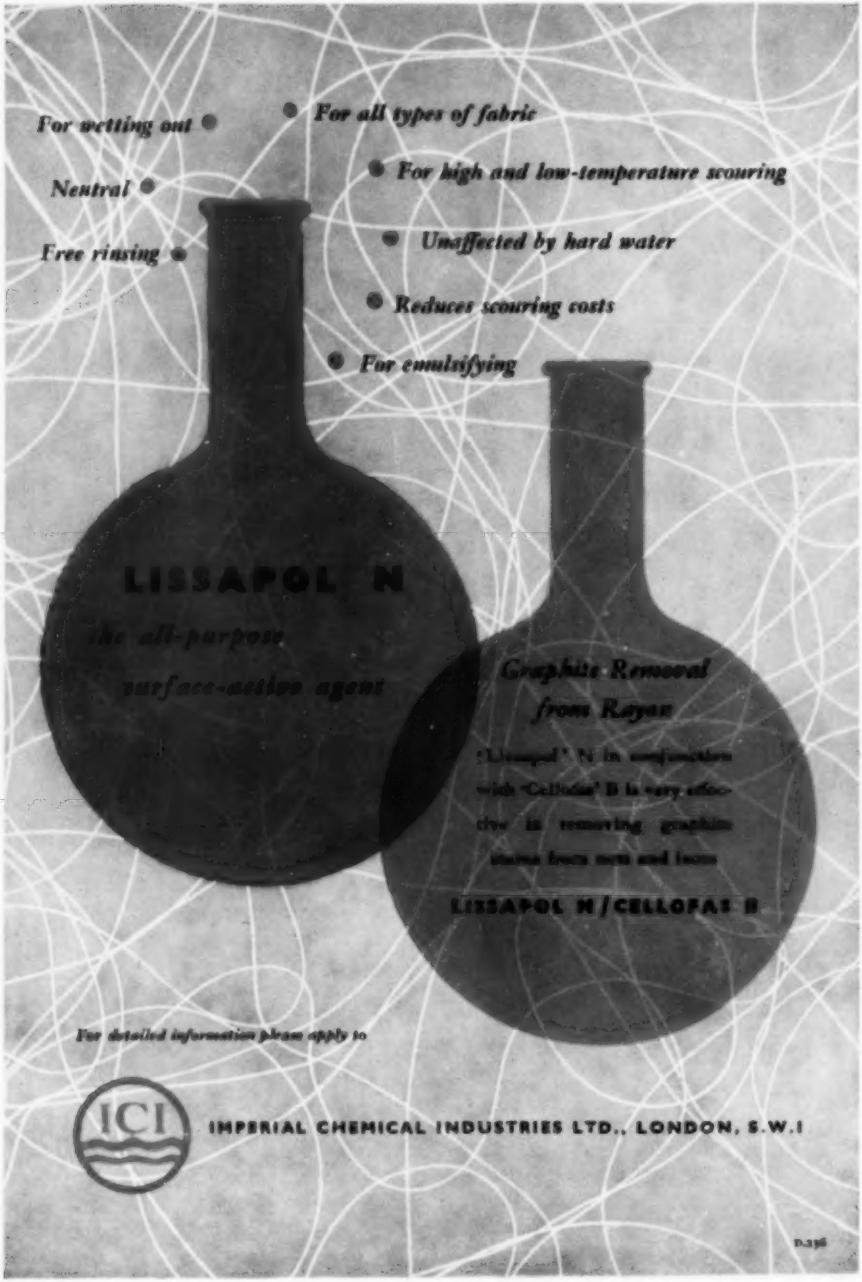
*Syton, Santobrite, Santomerse and Stymer are Registered Trade Marks.

MONSANTO CHEMICALS LIMITED
ALLINGTON HOUSE, ALLINGTON STREET, LONDON, S.W.1

In association with:—
Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Ltd., Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Ltd., Bombay.

Representatives in the world's principal cities.

MONSANTO
CHEMICALS – PLASTICS


For wetting out
Neutral
Free rinsing
For all types of fabric
For high and low-temperature scouring
Unaffected by hard water
Reduces scouring costs
For emulsifying
LISSAPOL N
the all-purpose surface-active agent
Graphite Removal from Rayon
'Lissapol' N in conjunction with 'Cellofas' B is very effective in removing graphite stains from new and loom
LISSAPOL N / CELLOFAS B
For detailed information please apply to
ICI
IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1
D.256

If you use Azoics
you must try the newest

SOLUNAPTOLS
Trade Mark

The greatest recent advance in the Azoic Colour Process

After years of experiment a perfected material
has been produced by

JOHN W. LEITCH & CO LTD

the modern pioneers in British Azoics

Trade Mark
SOLUNAPTOLS

SOLUNAPTOLS

- Are clean, easily handled powders
- Dissolve readily in boiling water
- Need no additions to the bath
- Give well balanced pH conditions
- Give solutions with exceptional wetting-out power
- Give solutions which penetrate more perfectly
- Produce dyeings which are faster to rubbing
- Offer real advantages coupled with economy
- Offer a considerable saving to you
- Mean cleaner working and less worry

SOLUNAPTOLS

For samples, prices and demonstrations apply to
the Sole Manufacturers

JOHN W. LEITCH & CO LTD

MILNSBRIDGE CHEMICAL WORKS

HUDDERSFIELD

Telephone **Milnsbridge 189 & 190** *Telegrams* **LEITCH MILNSBRIDGE**

AGENTS *for*

INDIA
Khatau Valabhdas & Co
Vadgadi Bombay

SCOTLAND
Kirkpatrick & Lauder Ltd
180 Hope Street Glasgow C2

CANADA
Prescott & Co Regd
2209 Hingston Ave N D G Montreal 28 QUE

The Rapidogen N brands

The Rapidogen N brands
provide possibilities of neutral development
without the use of special auxiliary products.
Simple and cheaper in use
with a wider field of application.

FARBENFABRIKEN BAYER LEVERKUSEN

BAYER

FLUORESCENT WHITENING AGENTS

1946 FIRST WITH TINOPAL BV

COTTON LINEN VISCOSE
TINOPAL BV, the most widely used of all optical bleaching agents, is now partnered by TINOPAL 2B which provides for all cases where a bluer shade is required.

WOOL
TINOPAL WG yields a pleasing neutral white, and is applicable to wool and other animal fibres under acidic, neutral and alkaline conditions. TINOPAL WR, applicable under acid conditions, yields a slightly redder shade.

ACETATE RAYON
TINOPAL ANA distinguished by its high light and wash fastness exhausts onto the fibre under neutral conditions.

NYLON
TINOPAL ANA is unexcelled in light and wash fastness. TINOPAL WG leads the field in whiteness. Both can be applied neutral.

LAUNDRIES
TINOPAL RSP, a speciality brand is the accepted product for improving the colour of white work.

1952 COMPLETE RANGE

THE Geigy COMPANY LIMITED

BS

TOWN END

Remember—

when dyeing wool

DURAMINE

AND

EVRON FAST

DYESTUFFS

TOWN END CHEMICAL WORKS LTD

BRAMLEY LEEDS

not give a beam of monochromatic light unless a source such as the mercury-vapour lamp is used.

It is a privilege of a reviewer to ask for more, although in this instance it may savour of greed. The discussion of the activity theory might include a worked example to illustrate the order of the corrections to be applied, e.g. in a buffer mixture. In Chapter V (Colorimetric Analysis) it would be of great benefit to have some discussion on the correlation of the relative concentration error with the instrumental error of the photometer. The use of cellulose and resin columns for the separation of ions prior to analysis is sufficiently advanced to warrant the inclusion of a few examples of these techniques.

This book is now more firmly established as a standard textbook. The publishers are to be congratulated on the excellence of their work. To the student the price may seem high; at approximately 0·6 of a penny per page the book is a bargain.

A. B. CRAWFORD

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be offered to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University.

Badische Anilin- und Soda-Fabrik

DYEINGS ON FINE PAPERS— This card shows twenty-eight dyes in five depths; nineteen mixture colourings are also included. With three exceptions the dyes used are from the Palatine Fast, Indanthren, Pigmosol, and Heliogen ranges.

Compagnie Française des Matières Colorantes

PASTEL SHADES WITH VAT COLOURS IN NEOPOWDER FORM— This card contains eight single and four mixture dyeings produced by the pigment-padding method.

CHROMINE BRILLIANT VIOLET ECR— This is a chrome dye for direct printing on cellulosic fibres, giving bright, full red-violets. Fastness figures include— Light 4, mild washing 5, chlorate printing 5.

Farbenfabriken Bayer

BENZO FAST COPPER DYESTUFFS ON COTTON PIECE— Seventeen dyes are shown as both direct and after-coppered dyeings in two depths. Fifteen two- and three-colour mixtures in three depths are also included.

RAPIDOGEN DYESTUFFS— This card illustrates a range of forty-two dyes. Six direct prints in two depths on cotton and viscose rayon are included for each dye, using acid steam development, neutral development with Rapidogen Developer N, and wet development respectively. In addition to fastness figures, details of the suitability of each method, the stability of the printing paste, and lists of other Rapidogens with which each may be used in mixtures are given alongside each set of patterns.

WOOL DYESTUFFS. I—ACID DYESTUFFS— This card contains dyeings in two depths of 231 acid dyes. The names of many have been changed from those appearing in earlier cards, but the old name is given in parentheses. There are now five groups— (i) Supracen (15), characterised by maximum level-dyeing properties; (ii) Supramine (21), giving dyeings of somewhat higher wet fastness than the first group; (iii) Supranol (45), having higher affinity from neutral dyebaths; (iv) Alizarine (19), similar in dyeing properties to the Supranols but having good light fastness; and (v) Acilan (101), the largest group, some of which are applied from strongly acid baths and others under neutral conditions. In general, they give dyeings of lower fastness to light than dyes of groups (i)–(iii).

DIRECT DYESTUFFS— I— This card illustrates 188 dyes. Each is shown in two depths on cotton, viscose rayon, and cuprammonium rayon, while, in addition, neutral and alkaline discharges on bleached mercerised cotton sateen are given. The names of the whole range have been uniformly prefixed by "Benzo", but the old names are given in parentheses. The amount of information given alongside each set of dyeings is particularly large, and includes figures illustrating the effect on dye absorption of temperature, time of dyeing, and salt concentration, and also a figure for "equalising capacity" based on the time taken for equality in depth to be reached when a dyed and an undyed hank are treated in a solution of Glauber's salt at 95°C.

ACRAMIN FWR POWDER, ETC.— This circular (No. Le 186e) contains details for using the following products for pigment printing by the Acramin F process — Acramin FWR Powder and Acramoll W Paste, which are film-forming agents; Acrafix F Paste, a film-fixing agent; Acrapon A Paste, an emulsion thickening; and Defoamer I. The process may be used with a range of nine Acramin dyes and gives prints superior in depth, brightness, and dry and wet rubbing compared with the earlier Acramin process.

RAPIDOGEN N DYESTUFFS— This card describes and illustrates a range of eight dyes. These are Rapidogens manufactured in a new form, which in conjunction with a new printing paste recipe may be developed in neutral steam without the addition of large quantities of Rapidogen Developer N, previously necessary particularly when printing alongside dyes which must be developed in neutral steam.

Imperial Chemical Industries Ltd.

BRENTHOLS ON COTTON: FASTNESS TO HYDROGEN PEROXIDE BLEACHING— This Technical Circular contains fastness figures for a representative range of Brenthol combinations on cotton. The effect of the test on the pattern and on the degree of staining of adjacent white cotton is detailed. It is significant that the number of combinations with satisfactory fastness to hydrogen peroxide is smaller than that which will withstand a hypochlorite bleach.

THE DYEING OF GOVERNMENT SERVICES MATERIAL (WOOL)— This Technical Circular gives selections of dyes and describes dyeing methods suitable for producing khakis, blue-greys, and navies on uniform cloths, blankets, knitted goods, and berets to meet the requirements of the Government Departments concerned. Difficulties encountered when processing particular types of material are discussed, and particular recommendations made in these cases, e.g. the addition of Calsolene Oil HS and pyridine to promote penetration when dyeing chrome dyes on berets using a single-bath or afterchrome method.

DYED BATHING COSTUME FABRICS: RESISTANCE TO CHLORINATED WATER— This Technical Circular contains the results obtained when dyeings of dyes normally used for colouring swim-wear made of acetate rayon, nylon, cotton, spun rayon, and wool were subjected to a test for resistance to "break point chlorination". This test consists in immersing the dyed samples at room temperature in a solution of sodium hypochlorite containing 5 p.p.m. free chlorine at pH 6, 7, and 8·5. Among the significant points which emerge are the comparatively low resistance of many of the disperse dyes on acetate rayon (the same dyes on nylon produce much more resistant dyeings); the complete unsuitability of the basic and sulphur classes of dyes with the exception of sulphur black; the relatively high proportion of direct dyes which are satisfactory on cellulosic fibres; and that all the dyes normally used on wool for this type of material withstand this test.

VAT DYEING— THE STANDFAST MOLTEN METAL PROCESS— This Technical Circular contains the substance of a paper by R. W. Speke read to Svenska Färgeritekniska Riksförbundet in Gothenburg and Norrköping in April 1951 (see Abstracts, p. 280).

THE AFFINITY OF VAT DYESTUFFS FOR COTTON.—This Technical Circular is a translation of a paper by J. A. Fowler, A. G. H. Michie, and T. Vickerstaff (see p. 280).

COLOURS FOR PRINTING INKS.—The products described in this pattern card are illustrated either as pure colour, or as colour plus alumina hydrate, ground into lithographic varnish and printed on a surface-coated paper. They include the following ranges—eleven Pastel colours, sixteen lakes and toners, twenty-eight Monolite colours, four phthalocyanine pigments, and twelve inorganic pigments. A selection of double-tone prints is also included, produced with black letterpress ink and Lithofor and Waxoline dyes using linoleic acid to bring the secondary colour into solution in the ink medium. Fastness figures appended include light, alkalis and acids, heat, methylated spirit, linseed oil, oleic acid, wax, and soap.

AN INTRODUCTION TO THE DYEING OF "ARDIL" PROTEIN FIBRE AND "TERYLENE" POLYESTER FIBRE.—This is a reprint of a paper by Audrey Barlow read before the Guild of Dyers and Cleaners (London Centre), and is issued for the use of students and others requiring an elementary treatment of these two subjects.

THE DYEING OF NYLON TEXTILES.—See Book Review, p. 261).

THE BEDAFIN 2001 PROCESS FOR PIGMENT PRINTING.—This pattern card contains eighteen direct prints on cotton using selected Monastral and Monolite pigments. The pigment is bonded to the fabric by incorporating it in a paste containing a solution of Bedafin 2001 (a solution of a non-drying urea–formaldehyde-modified alkyd resin in Cellosolve) in triethanolamine or ammonia, printing on to the fabric, and fixing by baking for 3–5 min. at 120–150°C. Fixation can be obtained at 100°C. or even lower to give results which are satisfactory in certain instances, but the high-temperature treatment is recommended whenever maximum wet fastness is required.

Sandoz Products Ltd.

TEXTILE AUXILIARY PRODUCTS.—The following pamphlets describe the properties, uses, and methods of application of a range of products for use in textile processing.

Ceranine FE.—A softening agent for cotton, linen, and rayon.

Ceranine HC 39.—A substantive softening agent fast to washing.

Eksaline F.—A levelling and dispersing agent for use with many classes of dyes, including premetallised, acid, chrome, direct, and vat dyes.

Emulsion ASN Conc.—An antistatic preparation.

Resoline A Paste.—A wetting agent for use in textile and leather processing.

Lanasan FB and CL.—Protective agents for wool. The FB brand is for use under neutral or alkaline and the CL under acid conditions.

Printagen E.—A print paste lubricant.

Sandopan N, TFL Extra, and WF.—Synthetic surface-active agents for wetting and scouring.

Sandozin NJ.—A non-ionic wetting agent and detergent.

Sandozin W and W Extra.—A non-ionic softening agent for cellulosic fibres which may be applied during dyeing or other wet processes.

Saroneg.—A solvent-type detergent for adding to milling liquors.

DYEING PROPERTIES OF DIRECT DYESTUFFS.—This booklet contains the results obtained when the whole range of direct dyes is classified according to the method sponsored by the Society. The method of testing has been amplified slightly, and a figure (on a 1–5 scale) for "migration" is given for each dye in addition to the standard A, B, and C classification.

ALIZARIN CHROME GREY BS.—A chrome dye applicable by all three methods, both alone and in mixtures, on all forms of wool. Some fastness figures (dyed afterchrome) include—Light 5, milling 5, potting 4.

DIAZAMINE FAST REDS AND BORDEAUX.—This card shows a range of eight direct dyes diazotised and developed with *β*-naphthol.

OMEGA CHROME BLUE GFS.—A chrome dye for application by the afterchrome method. Important characteristics include ease of metallisation and the degree of reservation attainable on cellulosic, cellulose acetate, and silk effects. Fastness figures include—Light 7–8, alkaline milling 5, potting 4.

SOLASAN SUPRA COLOURS.—A range of ten union dyes for use on wool–cellulosic fibre mixtures by a single-bath method to give dyeings having maximum fastness to light.

THIONAL BRILLIANT BLUE FB.—A sulphur dye giving bright blues the wet fastness of which is slightly improved by copper or chromium aftertreatment. It is suitable for machine dyeing. Fastness figures include—Light 6, washing 2, perspiration 2–3.

XYLENE FAST BLUE P2G.—An addition to the "Fast P" range characterised by good migrating power under the standard weakly acid dyeing conditions and compatibility in dyeing properties with other members of the group. Recommended for use alone and in mixtures on both yarn and cloth.

NYLOTAN M.—A reserving agent for nylon giving complete reservation in mixtures of this fibre with wool, cellulosic fibres, or silk. The reserve effect may be obtained by pretreating the nylon (which may be white or dyed), by adding the agent to the dyebath, or by an aftertreatment. It dissolves in water to give an alkaline reaction, and care must be taken if wool is present and its reserving power is impaired by the presence of ethylene oxide condensation products.

DYEINGS ON VEGETABLE-TANNED LEATHER.—Eighty-seven dyes in two depths are shown on East Indian goatskin. They have been selected from the acid and basic classes, and include both standard and speciality dyes for leather.

DYEINGS ON CHROME SUÈDE LEATHER.—Twenty Derma dyes and twenty-five selected acid and direct dyes are illustrated in this card.

Abstracts from British and Foreign Journals and Patents

(The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., **68**, *23 (Jan. 1952); while other abbreviations and symbols, together with a list of the periodicals abstracted, will be found at the end of the annual index.)*

I—PLANT; MACHINERY; BUILDINGS

Chemical Engineering Unit Operations. *Ind. Eng. Chem.*, **44**, 21–94 (Jan. 1952).

Permissible Maximum Concentration of Carbon Disulphide and Hydrogen Sulphide in Industrial Installations, with special reference to the Viscose Rayon Industry. E. Geiger. *Textil-Rund.*, **7**, 185–187 (April 1952).

The toxic properties of CS_2 and H_2S are discussed. Published figures for the max. safe concn. of CS_2 vary from 10 to 200 mg./cu.m., whilst the author has found 30 mg./cu.m. in practice. The published safe limit for H_2S is 28 mg./cu.m., whilst the author finds half this figure in practice. Suitably sealed apparatus and proper ventilation can overcome any trouble. B. K.

PATENTS

Drying of Filaments during their Manufacture. Kuljian Corpn. *USP* 2,574,833

Fibre Pick-up Drum and Squeeze Roll. E. H. Thompson and E. H. Brooks. *BP* 671,006

At the end of a fibre-scouring tank is a large perforated drum, through each hole of which protrudes a spike mounted on interior transverse peripheral bars. The spikes are so mounted that they protrude only through approximately the lower half of the drum as it rotates; thus they serve to pick up the scoured fibres as the latter approach the drum along the surface of the scouring liquor. A final spray of clean water is applied to the fibres as they leave the liquor; the pins then retract, permitting a squeeze roller to press against the mat of fibres. Another

part-turn brings the fibres against an ejector roller, which brushes them off down a chute. As the drum surface dips below the scouring liquor, the pins again protrude in readiness for further pick-up. J. W. B.

Pressure Dyeing of Packages of Yarn. Abbott Worsted Mills. *USP* 2,577,727

Cavitation is prevented from occurring at the intake of the pump impeller by providing an auxiliary pump, which takes dye liquor at atmospheric pressure and forces it under superatmospheric pressure into the body of confined dye liquor. C. O. C.

Drying Sized Warps. U.S. Secretary of Agriculture. *USP* 2,578,744

To prevent the threads from sticking together the drier has several rolls to separate the warp into as many sheets as there are section beams supplying the warp. The warp is kept so separated until it leaves the drier. This avoids the need for split rods, and the warp is left in better condition for weaving. C. O. C.

Drying or Heating Cloth, Paper, etc. H. Lodding. *BP* 670,952

The material is passed over a number of air-discharge slots and a number of air-suction slots; the slots are parallel to the material and at right-angles to its direction of movement, there being guide walls parallel to the material between adjacent slots. C. O. C.

Burners for Singeing Machines. Sir James Farmer Norton & Co. *BP* 670,463

A burner which gives a uniform flame from end to end is described. C. O. C.

Fabric-guiding Mechanism and Feeler Control Therefor. Nuproducts Corpn. *USP* 2,577,195

Dyeing Device comprising Rollers forming a Trough. J. Dungler. *BP* 670,505

Two horizontal rollers press against one another so as to form a trough above their line of contact, each end of this trough being sealed by an impermeable cheek pressed against it. Between this cheek and the pressure-applying means there is a wholly or partly flexible envelope filled with a deformable substance, e.g. liquid or an elastic substance, under pressure. This provides liquid-tight ends, which are not liable to wear quickly and which do not need uniform pressure applying to them. C. O. C.

Intermittently Advancing a Continuous Web. Egry. *BP* 670,783

An improved device having automatically adjustable stop means to ensure that the web is stopped in correct registration for printing or other operation. C. O. C.

Calender. Pennsylvania Co. *USP* 2,578,594

A tandem-type supercalender which successively treats opposite sides of the cloth or paper against hard-surfaced rolls and includes resilient soft fibre or "paper" rolls which are so mounted that they can be swung around the hard rolls, and so can be replaced without stopping or slowing down the machine. C. O. C.

Drying Fabric during and after Screen Printing. N.V. P. F. van Vlissingen & Co.'s Katoenfabrieken. *BP* 670,282

Moist air is sucked from above the table, while drying air is supplied below the table. The drying air passes through gaps between the table top and its supports, and ascends over the longitudinal edges of the table. C. O. C.

Laundry Machine having Washing, Rinsing, and Extraction Devices. E. C. Olson. *USP* 2,574,752

Laundering or Dry-cleaning Machine using Compressed Air to agitate the Goods and circulate the Liquor. J. Barnes. *USP* 2,575,039

Drum Washing Machine of the End Discharge Type. H. Miller. *USP* 2,575,673

Cleaning Garments or Fabrics. E. A. Creswick. *BP* 671,114

Liquid used in cleaning garments or fabrics is continually renovated by employing two circulating systems, for washing and rinsing respectively, independently of each other. Each moves from its own reservoir through a filter and back again, thus enabling alternate washing and rinsing with intermediate cleaning of the liquors. J. W. B.

Laundry Drier. A. Miller. *USP* 2,575,672

Wet goods in a truck are forced upwards through the truck against a retaining and draining compartment, by means of a hydraulic press. When the goods have been compressed, a door automatically opens in the container, the goods at the same time being forced out of the container on to a conveyor. The truck has partitions in it, so that when the goods are compressed only the articles in each partition overlap one another, and thus the bulk of compressed goods is readily broken down into smaller units, depending on the number of partitions in the truck. C. O. C.

Dry-cleaning Apparatus using Atomised Solvent. W. R. Dapprich. *USP* 2,574,731

The article to be cleaned is placed in a chamber, where a current of atomised solvent is directed into and away from it by means of a specially designed cleaning head. This avoids the necessity of saturating the article with the solvent, and so avoids protracted drying and retention of the smell of the solvent. C. O. C.

Drying Leather. J. C. Tusting and G. Overstall. *BP* 670,656

Apparatus is described in which manual labour is necessary only for attaching the skins to, and removing them from, carrier frames. C. O. C.

Feather-drying System. A. M. Schroeder. *USP* 2,574,848

Apparatus for producing Self-supporting Wrinkle Film. New Wrinkle. *USP* 2,576,317

Producing and Conditioning Thermoplastic Filaments (VI p. 279).

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Allyloxymethylmelamines (Allyl Ethers of Methylolmelamines). E. R. Atkinson and A. H. Bump. *Ind. Eng. Chem.*, **44**, 333–334 (Feb. 1952).

The tetra-allyl ether of tetramethylolmelamine has been isolated in the form of a hydrophobic gum. It possesses properties similar to drying oils, forming insoluble films on air-drying at room temp. The corresponding n-propyl ether has no drying properties. When two additional, non-etherified hydroxymethyl groups were introduced, the drying properties were less pronounced. Aqueous dispersions of the allyl ether were prepared by the action of sulphur dioxide or sodium metabisulphite, but the process does not involve the addition of sulphite to the unsaturated allyl radicals. W. K. R.

Important Characteristics of Wool Oil. B. A. Ryberg. *Amer. Dyestuff Rep.*, **41**, 189–192, 213 (31 March 1952).

Desirable characteristics of wool oils are discussed, together with an account of the influences of carding, spinning, and dyeing on oil behaviour. J. W. B.

Constitution of some Wool Wax Esters. J. Tiedt and E. V. Truter. *Chem. and Ind.*, 403 (3 May 1952).

Purified wool-grease esters are separated by an 85-stage fractional crystallisation from ethyl methyl ketone, and though each fraction still does not consist of a single ester, certain definite identifications are made. Cholesteryl 24-methylhexacosanoate, cholesteryl 26-methyloctacosanoate, cholesteryl 28-methyltriacontanoate, and a diester of a hydroxy acid are found. J. W. B.

Surface-active Alkyl Aroylsulphopropionates. G. W. Hedrick, W. M. Linfield, and J. T. Eaton. *Ind. Eng. Chem.*, **44**, 314–317 (Feb. 1952).

A series of alkyl esters of substituted aroylsulphopropionic acids of general formula Ar-CO-A(SO_3M)-$COOAlk$ (Ar = subst. aryl, A = an ethylene group, M = an alkali metal, and Alk = alkyl or subst. alkyl) have been prepared by Friedel-Crafts acylation of the appropriate aromatic compound with maleic anhydride, followed by esterification of the resulting aroylacrylic acid and treatment with alkali-metal bisulphite. By suitable choice of the alkyl ester group and of the substituents of the aroyl group, the properties may be modified as desired to produce a wetting agent or detergent. Selected members of the series show promise as commercial wetting agents and detergents, and as water carriers in dry cleaning. W. K. R.

Effect of pH on the Rate of Surface-tension Lowering. E. J. Burcik and C. R. Vaughn. *J. Colloid Sci.*, **6**, 522–527 (1951); *Chem. Abs.*, **46**, 2876 (10 April 1952).

The rate of surface-tension lowering with the hydrolysable anionic agent Na myristate increases with increasing pH, whereas with the hydrolysable cationic agent $C_{10}H_{21}NH_2HCl$ it decreases with increasing pH. The rate is independent of pH with the non-hydrolysable agent Na dodecyl sulphate. C. O. C.

PATENTS

Sodium Hexametaphosphate Compositions for Treating Water. Monsanto. *USP* 2,575,176·9

The production is described of sodium hexametaphosphate compositions which readily dissolve and do not mat or cake at the bottom of the liquor. C. O. C.

Cationic Surface-active Agents. Colgate-Palmolive-Peet Co. *BP* 670,326

A method of making pure *N*-aminoalkylmonoamides having surface-active properties. C. O. C.

Naphthenic Acid Derivatives—Emulsifying and Wetting Agents. Société Carbochimique. *BP* 670,153

Surface-active products, insensitive to hard water and varying pH, and without the bad odour of the naphthenic acids, are obtained by treating a naphthenic acid fraction with an epoxide so as to lengthen the side-chain. C. O. C.

Size for Spun Acetate Rayon. Celanese Corpn. of America. *BP* 670,835

A mixture of an aqueous solution of polyvinyl alcohol, a hygroscopic substance, a lubricant, and a conditioning agent is used. The lubricant consists of mineral oil, oxidised vegetable oil or oxidised sperm oil, a dialkylphenol, a hydroxyalkylamine, and a higher fatty acid. The conditioning agent consists of the desalted and dehydrated alkali-neutralised product of oleum with a higher fatty acid, a vegetable oil, and a mineral oil, which product has been diluted with mineral oil. C. O. C.

Size for Nylon. Monsanto. *USP* 2,576,915

A non-dusting size for nylon warps consists of an aqueous solution or dispersion of an alkali-metal salt of a copolymer of an ethylene-$\alpha\beta$-dicarboxylic acid or anhydride or an alkyl hydrogen ester of such acid with styrene or a substituted styrene and, as plasticiser, a polyalkylene glycol. C. O. C.

Stable, Water-soluble, Cationic Melamine Formaldehyde Resins. Imperial Paper & Color Corpn. *USP* 2,577,767

A water-soluble cationic melamine-formaldehyde resin, stable to storage but heat-curable, is produced by treating melamine-formaldehyde with a hydroxyalkylamine in presence of a polyhydric alcohol so that the condensate remains water-soluble or -dispersible, bringing to pH 0·5–2·0, and then neutralising. C. O. C.

Water-repellent Composition. Union Carbide & Carbon Corpn. *USP* 2,577,840

A dry powdered water-repellent composition consists of wax (35–70 parts by wt.), polyvinyl alcohol (12–20), water-soluble Al or Zr salt of a fatty acid or other dissociable metallic salt (10–20), Na diacetate (10), and an amine (1–2). C. O. C.

Acyl Ureides—Water-repellent, Dispersing, and Wetting Agents, Dye Intermediates, etc. Procter & Gamble Co. *USP* 2,574,864

An improved process of making acyl ureides useful as water-repellent, dispersing, and wetting agents, vulcanisation accelerators, softeners and antioxidants for rubber, dye intermediates, etc. C. O. C.

Lubricating and Conditioning Composition. Celanese Corpn. of America. *USP* 2,575,382

A mixture of mineral oil, a partial ester of phosphoric acid with a long-chain aliphatic alcohol, an alkanolamine ester and/or amide of a long-chain aliphatic acid, a tertiary amine, e.g. diethylcyclohexylamine, and an alkylphenol, e.g. diamylphenol, is a satisfactory lubricating and anti-static composition, especially suitable for use on cellulose esters.

USP 2,575,399

A mixture of mineral oil, a partial ester of phosphoric acid with a long-chain aliphatic alcohol, an alkanolamine ester of a long-chain aliphatic acid, an alkanolamine, e.g. triethanolamine, and an alkylphenol is used. C. O. C.

***NN'*-Diacylaryldisulphonamides.** General Mills. *USP* 2,571,995

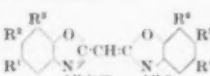
NN'-Diacylaryldisulphonamides in which the acyl groups contain 8–18 C, e.g. *NN'*-dilauroylbenzenedisulphonamide, are soluble in alkali and useful as waxes, as surface-active agents, and in textile finishes. Their copper salts can be precipitated as rotproofing agents on textiles, or their aluminium salts as sizes or waterproofing agents. C. O. C.

Copper-containing Aqueous Solutions of Silk. T. C. Whitner. *USP* 2,575,152

A mixture of cupric hydroxide and silk readily dissolves in aqueous alkali-metal hydroxide with little formation of insoluble copper oxide so long as unchanged silk is present while the cupric hydroxide dissolves. C. O. C.

Optical Bleaching Agents for Acetate Rayon and Nylon. Ilford. *BP* 669,896

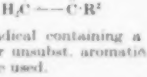
Compounds of formula—



(R^1–R^6 = H, Alk, alkoxy, Hal, subst. amino, etc.; X = an acid radical), giving colourless solutions in ethyl alcohol, have strong violet or pale or deep blue fluorescence in daylight, which diminishes slightly in artificial light. From aqueous solution they show remarkable non-selective affinity for all types of fibres, being as readily taken up by nylon or acetate rayon as by other fibres. C. O. C.

Optical Bleaching Agents. Ilford. *BP* 670,857

Products of formula—



(R^1 = an aromatic radical containing a sulphonic acid group; R^2 = subst. or unsubst. aromatic radical; R^3 = Alk, Ar, or aralkyl) are used. C. O. C.

Agent for Improving the Fastness of Dyeings on Cellulosic Textiles. Dan River Mills. *USP* 2,576,241

Dicyandiamide-copper chloride(or nitrate)-formaldehyde condensates (e.g. the product obtained by treating dicyandiamide with $CuCl_2$ and then with formaldehyde dissolved in HCl) are substantive to cellulose. They exhaust on to the fibre from dilute solution and need no curing. C. O. C.

Vinyl Resins for Improving the Fastness to Rubbing of Azoic Dyeings. Monsanto. *USP* 2,575,026

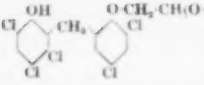
After the developer has been applied the material is impregnated, before being dried, with an aqueous solution of a water-soluble or -dispersible ammonium, amine, or "amidated" salt or derivative of a copolymer of a compound of formula $R{\cdot}CH{:}CH_2$ (R = subst. or unsubst. phenyl) with an ethylene-$\alpha\beta$-dicarboxylic anhydride and/or acid and/or an alkyl (Alk of 1–6 C) half ester of such an acid, and is then dried, preferably at a temperature which insolubilises the copolymer. C. O. C.

Agents for Producing Dimensional Stability and/or Crease and Crush Resistance. Monsanto. *BP* 669,991

A monomeric or low-polymeric aliphatic or heterocyclic amino compound-aldehyde condensate or -an alkylated derivative thereof is treated with a halogenating agent until the condensate contains active halogen. The product, applied to textiles and cured *in situ*, gives them excellent dimensional stability and/or crease and crush resistance without affecting their handle or unduly reducing their tensile strength. C. O. C.

Bacteriostatic and Hydrophilic Finishing Agents. Pacific Mills. *USP* 2,574,189

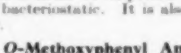
Compounds of formula—



(R = H or CH_2Cl) when applied to cellulose, e.g. from solution in benzene or dispersed in aq. sodium acetate, render it bacteriostatic. It is also given greater affinity for water. C. O. C.

***O*-Alkyl *O*-Methoxyphenyl Amidothiophosphates—Insecticides and Fungicides.** Dow Chemical Co. *BP* 671,142

Compounds of formula—



(X = Alk of 1–4 C; R^1 and R^2 = H or lower Alk) are insecticides and fungicides. C. O. C.

Rubber Antioxidants. United States Rubber Co. *BP* 670,934

p-Dihydroxybenzenes substituted on the benzene ring by one or more 8-Alk groups are excellent rubber antioxidants. C. O. C.

Zein Pigment Chips (V p. 276).

Absorption of Electrolyte by Alginate Gels without and with Cation Exchange (VI p. 278).

Intrinsic Viscosity of Sodium Alginate (VI p. 278).

Influence of Ion Exchange on Optical Properties, Shape, and Elasticity of Fully Swollen Alginate Fibres (VI p. 278).

Heat Effects accompanying the Absorption of Simple Electrolytes by Fully Swollen Alginate and Cellulose Gels. A New Microcalorimetric Method (VI p. 278).

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Nitration and Hydroxylation of Aromatic Compounds by Pernitrous Acid. E. Halfpenny and P. L. Robinson. *J.C.S.*, 939–946 (March 1952).

The reactions between pernitrous acid and benzene, toluene, nitrobenzene, dimethylaniline, phenol, anisole, and chlorobenzene are described. Both hydroxylation and nitration occur, and diphenyl derivatives have been isolated in the cases of benzene, nitrobenzene, and dimethylaniline, but the products are mainly *m*-nitro compounds, *o*- and *p*-hydroxy compounds, or derivatives of *o*-nitrophenol. Hydroxylation is considered to be due to hydroxyl radicals produced by the homolytic fission of pernitrous acid, and nitration to be due to reaction of nitrogen dioxide with the free aryl radicals present in the solution. H. H. H.

Kinetics and Mechanism of Aromatic Nitration. IX—Nitrosating Agents in Nitrations catalysed by Nitrous Acid. E. L. Blackall, E. D. Hughes, and C. K. Ingold. *J.C.S.*, 28–32 (Jan. 1952).

Rate-determining Factors in Certain *ortho*-Nitrations. J. C. D. Brand and R. P. Paton. *J.C.S.*, 281–286 (Feb. 1952).

Preparation of 1-Chloro-2:6-dinitrobenzene. F. D. Gunstone and S. H. Tucker. *J. Appl. Chem.*, **2**, 204–208 (April 1952).

Sulphonation of chlorobenzene followed by nitration at 130°C. gave 2:6-dinitrochlorobenzene-4-sulphonic acid, which with ammonia was converted into 2:6-dinitroaniline-4-sulphonic acid. This on refluxing with 60% sulphuric acid gave 2:6-dinitroaniline, which on diazotisation and treatment with cuprous chloride gave 1-chloro-2:6-dinitrobenzene (I) in an overall yield of 37–45%. I was obtained in 50% yield by treating 2:6-dinitrophenol with phosphorus pentachloride and phosphoryl chloride in diethylaniline. With a slight equimolar excess of titanous sulphate, I was reduced to 2-chloro-3-nitroaniline, which was converted by means of its diazonium salt to 2-chloro-3-nitrobenzonitrile. This on hydrolysis gave 2-chloro-3-nitrobenzoic acid. C. H. R.

Spectrophotometric Determination of the Ionisation Constants of Aromatic Nitro Compounds. J. C. D. Brand, W. C. Horning, and M. B. Thornley. *J.C.S.*, 1374–1383 (April 1952).

The ultraviolet absorption spectrum of aromatic nitro compounds is modified characteristically in powerfully acid (H_2SO_4 and $H_2SO_4 \cdot SO_3$) solvents by the transfer of a proton to the nitro group, giving ions $Ar\text{-}NO\text{-}OH^+$, with alteration of the binding energies (but not the number) of the π-electrons. The ionisation constants are now evaluated from these spectra, and it is found that simple mononitro compounds are weak bases in anhydrous sulphuric acid, but are quantitatively ionised in concentrated oleum, whereas di- and tri-nitro compounds are much less basic and are incompletely ionised at all concentrations. Attention is drawn to the discrepancy between the ionisation constants now reported and those obtained by cryoscopic methods (cf. Gillespie, *J.C.S.*, 2542 (1950)), the reasons for which are discussed. H. H. H.

New Amine Arylsulphonates. L. Bauer, J. N. Baxter, J. Cymerman, and W. J. Sheldon. *J.C.S.*, 1184–1185 (March 1952).

The benzenesulphonates of 2-aminothiazole and 2-aminopyrimidine, the toluene-*p*-sulphonates of *p*-aminoazobenzene, *p*-aminodiphenylamine, *p*-aminodiphenyl sulphide, *p*-aminodiphenyl sulphone, 2-aminofluorene, *p*-phenoxyaniline, *p*-*cyclo*hexylaniline, 2-aminodibenzofuran, *p*-aminodiphenylmethane, and 5-aminoacridine, the hydrochlorides of *p*-aminoazobenzene, *p*-aminodiphenylamine, and *p*-aminodiphenyl sulphide, and the dihydrochloride of 4:4′-diaminodiphenyl sulphone are described. Formation of azoxy compounds is generally regarded as occurring only in alkaline media, but the reduction of 2-nitrodibenzofuran with zinc and calcium chloride, and of *p*-nitrodiphenyl sulphone with stannous chloride and hydrochloric acid, afforded the corresponding azoxy compounds in 15% and 8% yield respectively, in addition to the anticipated primary amines. H. H. H.

Production of Phthalic Anhydride by Oxidation of Tar Oils. J. Shelmerdine, F. Popper, and D. McNeil. *Chem. and Ind.*, 216 (8 March 1952).

Naphthalene oil, produced by distillation of a coke-oven tar and containing 54·9% naphthalene and 10·7% monomethylnaphthalenes after removal of tar acids, is oxidised at 380–420°C. over a vanadium pentoxide–potassium sulphate–silica catalyst. The yield of phthalic anhydride = 117·5% on the naphthalene in the original oil; the method is thus more efficient than that whereby naphthalene is first isolated and then oxidised. J. W. B.

New Intermediates and Dyes. II—Preparation and Properties of 4-*tert.*-Butylphthalic Anhydride. Orientation of its Condensation Products with Benzenoid Hydrocarbons. B. W. Larner and A. T. Peters. *J.C.S.*, 680–686 (Feb. 1952).

4-*tert.*-Butyl-*o*-xylene is prepared in 73% yield by interaction of a slight excess of *tert.*-butyl chloride and *o*-xylene in presence of anhydrous ferric chloride at room temperature, and oxidised with $KMnO_4$ in boiling aqueous pyridine to give 50% of 4-*tert.*-butylphthalic acid and 9% of 4-*tert.*-butyl-2-methylbenzoic acid, which are converted by boiling acetic anhydride into the respective anhydrides. The reactions of 4-*tert.*-butylphthalic anhydride are examined, and also those of many derivatives, and it is found that the carbonyl group *para* to the *tert.*-butyl group is the more reactive in Friedel-Crafts condensations with benzenoid hydrocarbons. 4-*tert.*-Butyl-*o*-xylene is unchanged by chromic acid in boiling acetic acid. H. H. H.

Spectral Absorption Curves of Solid Dye Film. A. T. Vartanyan. *J. Tech. Phys. U.S.S.R.*, **20**, 847–853 (July 1950); *J. Textile Inst.*, **43**, A 167 (March 1952).

Spectral absorption curves of twenty-four dyes belonging to different classes have been obtained using a Beckmann photoelectric spectrometer, the range being 200–800 mμ. The characteristics of the curves are discussed. C. J. W. H.

Effects of Substituents on Ultraviolet Absorption Spectra. R. D. Brown. *Nature*, **169**, 286–287 (16 Feb. 1952).

Experimental and theoretical evidence is summarised to show that substituents in a conjugated system, e.g.

alkyl groups in azulene, may produce hypsochromic shifts more frequently than is commonly supposed. J. W. B.

Studies in Light Absorption. X—Further Observations on Ultraviolet Auxochromes. A Survey of the Effects of Some of the Less Common Elements. K. Bowden and E. A. Braude. *J.C.S.*, 1068–1077 (March 1952).

Generalisations previously made (cf. *J.C.S.*, 948 (1946)) on the spectral effects of covalently saturated substituents on the ultraviolet absorption of ethylenic and aromatic systems are now amplified by data for 16 phenyl derivatives $C_6H_5XAlk_3$ (X represents elements of Groups IV, V, VI, and VII of the Periodic Table). When X = C, Si, Sn, Pb, or Hal, the auxochromic effects are relatively small, whereas the elements of Groups V and VI produce large effects. The observations are discussed in relation to current theories of electronic spectra. H. H. H.

Light Fastness and Ultraviolet Absorption of Dyes. A. Luszczak and H. Zukriegel. *Melliand Textilber.*, **32**, 868–870 (Nov. 1951).

Extinction curves have been prepared with various dyes for wood and cotton, and show a certain regularity in the extinction of aqueous solutions of the dyes when exposed to ultraviolet radiation. There is a correlation between the position of a characteristic extinction band and the evaluation of light fastness which can be expressed mathematically by the equation—

$$L = 14 - \frac{10{,}800}{4000 - \lambda}$$

(L = light fastness and λ = wavelength). B. K.

Problems arising from Use of Colouring Matter in Foods. P. R. Peacock. *Chem. and Ind.*, 238–241 (15 March 1952).

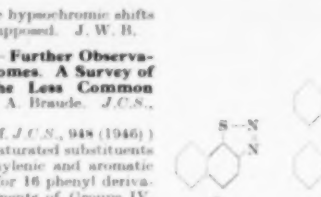
In a survey of the use of colouring matters in food stress is laid on the difficulties of obtaining accurate information as to carcinogenic properties. Biological assay is prolonged, even on short-lived animals, and new substances are forthcoming much faster than they can be tested. Moreover, some compounds are toxic to some animals but not to others. A list of carcinogenic structures is presented, and attention drawn to the similarity between some of these and permitted food colorants; it is suggested that addition of any synthetic substance to food should be banned. J. W. B.

Certified Food Colours. G. C. Inskeep and W. H. Kretlow. *Ind. Eng. Chem.*, **44**, 12–20 (Jan. 1952).

In the U.S.A. only certified dyes may be used for colouring foods, drugs, and cosmetics. There are 117 certifiable dyes, comprising—19 for use in foods, drugs, and cosmetics (designated FD&C), of which 15 are water-soluble and 4 are oil-soluble; 68 for use in drugs and cosmetics only (D&C); and 30 for use in externally applied drugs and cosmetics only (External D&C). Certain lakes derived from certified dyes are permitted in cosmetics. The dyes are manufactured to rigid government-controlled specifications, the purity required being such that manufacturing technique must be carefully controlled, and there is a minimum tolerance on pure dye content. The chemical properties and solubilities of the FD&C dyes are discussed, and manufacturing technique is illustrated by a detailed description of an actual manufacturing process for FD&C Orange No. 1 (*C.I.* 150). W. K. R.

o-Mercapto-azo Compounds. II—1-(1-Mercapto-2-naphthylazo)-2-naphthol. A. Burawoy and C. Turner. *J.C.S.*, 1286–1292 (April 1952).

The different behaviour of the *o*-mercapto-azo compounds of the benzene and naphthalene series is noteworthy. The tetrazonium salt from di-(2-amino-1-naphthyl) disulphide reacts with water much faster than its benzene analogue, forming naphtho(2′:1′:4:5)-1-thia-2:3-diazole (I), and it couples when its conc. H_2SO_4 solution is added directly to alkaline β-naphthol, but then yields only I and the sulphide (II); the disulphide (III) is not formed here, but is obtained by coupling diazotised 1-thiocyanato-2-naphthylamine with β-naphthol and treating the resulting 2-(2-hydroxy-1-naphthylazo)-1-thiocyanatonaphthalene with NaOH. The oxidation to sulphenic anhydride rather than disulphide, and complex salt formation with copper, nickel, and cobalt, of *o*-mercapto-azo compounds are discussed.



(I) (II) (III)

H. H. H.

Heterocyclic Fluorides from Diazonium Fluorosilicates. R. D. Beaty and W. K. R. Musgrave. *J.C.S.*, 875–878 (March 1952).

Condensation of Aryldiazonium Salts with Reactive Unsaturated Compounds. IV—Action of Aryldiazonium Salts on α-Methylacrylic Acid. M. Krishnamurti and K. B. L. Mathur. *J. Indian Chem. Soc.*, **28**, 507–510 (Sept. 1951).

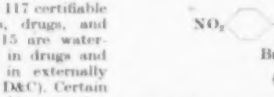
p-Chlorobenzenediazonium chloride with α-methylacrylic acid gave the α-methylcinnamic acid—

$$Cl\text{-}C_6H_4\text{-}CH{:}C(CH_3)\text{-}COOH$$

Similar results were obtained with *m*- and *p*-nitrobenzenediazonium chlorides and β-naphthalenediazonium chloride, although the yields were lower than those obtained with acrylic acid. C. H. R.

Condensation of Aryldiazonium Salts with Reactive Unsaturated Compounds. V—Action of Aryldiazonium Chlorides on Bromomaleic Acid. S. D. Rehan and K. B. L. Mathur. *J. Indian Chem. Soc.*, **28**, 540–546 (Oct. 1951).

p-Nitrobenzenediazonium chloride gave with bromomaleic acid *trans*-*p*-nitro-α-bromocinnamic acid (I). Similar results were obtained with *o*- and *m*-nitrobenzenediazonium chlorides and α- and β-naphthalenediazonium chlorides. *p*-Chlorobenzenediazonium chloride, however, gave *cis*-*p*-chloro-α-bromocinnamic acid (II), as did the corresponding *o*- and *m*-compounds. *p*-Bromobenzenediazonium chloride gave a mixture of *cis*- and *trans*-*p*-bromo-α-bromocinnamic acid. It would appear, therefore, since the addition of HBr to bromomaleic acid gives only the αβ-dibromo compound and is unaffected by the presence of peroxides, that ionic and radical addition are not reversed in the case of bromomaleic acid. A mechanism for the reaction is postulated.



(I) (II)

C. H. R.

Researches on Monolayers. I—Molecular Areas and Orientation at Water Surfaces of Aromatic Azo Compounds containing Long Alkyl Chains. C. H. Giles and E. L. Neustadter. *J.C.S.*, 918–923 (March 1952).

Examination, for unimolecular film-forming properties on water, of a series of 22 aromatic azo compounds containing straight alkyl chains (C_{12}–C_{18}), and in most cases one OH group *ortho* or *para* to the azo group, shows that condensed films are formed in all cases where an OH group is present and the alkyl chain has at least 16 C, and in several cases where it has 12 C. In the absence of an OH group at least two azo groups are required to give the necessary water attraction for stable films. The molecules (~ 6 Å. apart) appear to be oriented in the films with the plane of the aromatic nuclei vertical, but the longer axis of this plane is in many cases tilted from the perpendicular at an angle depending on the nature and relative position of the various substituent groups. H. H. H.

Solubility and Light Fastness of Azo Dyes—I. A. B. Sen and R. C. Shanno. *J. Indian Chem. Soc.*, **28**, 657–660 (Nov. 1951).

The solubilities of a number of simple monoazo dyes in benzene, petroleum ether, and groundnut oil have been studied, and the light fastness in the last solvent has been measured. In the case of the first two solvents it was found that the solubility was inversely proportional to the

m.p. of the dye. In groundnut oil, however, this relationship did not hold, but *m*-substituted dyes appeared to be most soluble as compared with those with *o*- and *p*-substituents. C. H. R.

Relation between Structure and Properties of Azo Dyes. B. M. Bogoslovsky and F. I. Sadov. *Tekstil. Prom.*, **12**, 31–33 (Jan. 1952).

Each of the seven α-naphthylaminesulphonic acids is diazotised and coupled with α-naphthol, β-naphthol, α-naphthylamine, and β-naphthylamine. The 28 acid dyes so obtained are examined for their absorption spectra in aq. soln., for their dyeing affinity for wool, and for their fastness to light and washing when dyed on wool. Among regularities noted are that dyes from α-naphthol have lower light fastness but higher wash fastness than those from β-naphthol, the light fastness depending greatly on the position of the sulpho group (α-naphthol—highest when SO_3H at 4, 5, or 6, lowest at 2 or 8; β-naphthol—lowest at 3, 7, or 8). The affinity for wool is higher when the SO_3H is in a quinoid position (e.g. 4 or 7) relative to the azo group. A. E. S.

Relation between Chemical Structure and Colloidal and Dyeing Properties of Direct Azo Dyes. II—Azo Dyes from Chloronaphtholsulphonic Acid and Dehydrothio-*p*-toluidine. I. Ikoma and K. Shiozawa. *J. Soc. Textile Cellulose Ind.* (Japan), **5**, 150–152 (1949): *Chem. Abs.*, **46**, 3279 (10 April 1952).

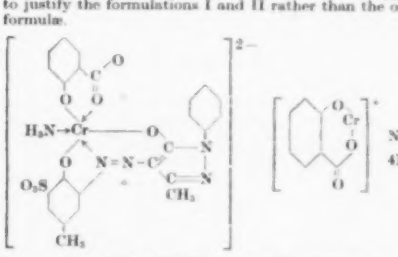
From diffusion (determined with a porous glass plate) and dyeing (in 10% NaCl bath at 50 and 90° C.) experiments with Diamine Brilliant Blue G, Diamine Pink FFB, and Chloramine Yellow G, no parallelism was found between aggregation, substantivity, and mol. wt. except for an inverse relation between substantivity and levelling. Diamine Pink FFB, which has an unsymmetrical structure, showed highest aggregation but poor substantivity and fairly good levelling, while the other two dyes, which have a symmetrical structure, showed highest substantivity but poor levelling. C. O. C.

Small-scale Preparation of Methyl Red Indicator. R. G. Gillis. *Australian J. Sci. Research*, **A 4**, 435 (1951): *Chem. Abs.*, **46**, 3017 (10 April 1952).

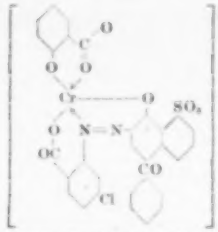
Anthranilic acid (6·85 g.) is dissolved in acetic acid (50 ml.), the solution cooled in ice until acetic acid begins to crystallise, butyl nitrite stirred in so that the temperature does not rise, and after 15 min. dimethylaniline (10·3 ml.) stirred in rapidly, the mixture kept in ice for not < 3 hr., and the precipitated Methyl Red filtered off, washed with acetic acid (10 ml.), and dried *in vacuo* over NaOH. Yield 7–8 g. C. O. C.

Composition of the Chromium-complex Dyes formed by chroming Sulphonated *oo*'-Dihydroxy- and *o*-Hydroxy-*o*'-carboxy-azo Dyes with Ammonium Chromisalicylates. G. Schetty. *Helv. Chim. Acta*, **35**, 716–729 (May 1952).

The chroming of *oo*'-dihydroxy- and *o*-hydroxy-*o*'-carboxy-azo dyes containing sulphonic acid groups, with disalicylatochromic acid or its ammonium ammine salts, gives rise to complexes containing bound salicylic acid but not always covalently bound ammonia. Formulæ for these chrome complexes are suggested. Chrome complexes of dyes containing a sulphonic acid group *ortho* (e.g. I) or *peri* (e.g. II) to a hydroxyl group which participates in the formation of the complex have special chemical, physical, and dyeing properties, which appear to justify the formulations I and II rather than the older formulæ.



I—Chromium Complex of 2-Amino-4-methylphenol-6-sulphonic Acid→3-Methyl-1-phenyl-5-pyrazolone



II—Chromium Complex of 2-Amino-4-chloro-1-benzoic Acid→4-Benzoyl-1,8-naphtholsulphonic Acid H. H. H.

Colour-coupling Dyes. K. Furuya, T. Miyazawa, and A. Komuro. *J. Soc. Sci. Phot. Japan*, **12**, (1), 8–14 (1949): *Chem. Abs.*, **46**, 2936 (10 April 1952).

Dibromo-2-naphthol, 1-β-naphthyl-3-methylpyrazolone, and benzoylacetanilide were used as the coupling agents and diethyl-*p*-phenylenediamine as main developer. The coupling agent and developer were cooled by ice in KOH soln., and coupling was carried out by addition of 20% $K_3Fe(CN)_6$ soln. The three products were purified by repeated recrystallisation from dimethyl ketone and water. The main wavelength of absorption of their solution varies according to the strength of the solution. The C.I.E. three-colour coefficient for each dye was obtained. The relation between dye concentration and three-colour coefficient is not linear, and the main wavelength value changes with concentration. C. O. C.

Synthesis and Characterisation of *o*-Aminothiophenol. J. Nys and A. Van Dormael. *Bull. Soc. Chim. Belg.*, **60**, 319–324 (Sept.–Oct. 1951).

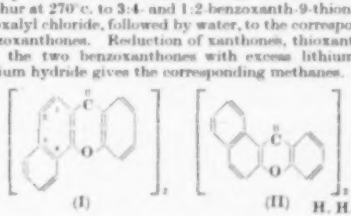
An 80% yield of *o*-aminothiophenol was obtained on heating 2-mercaptobenzothiazole with very conc. KOH soln. at 210–220° C. under atmospheric pressure. *o*-Aminothiophenol with 2:4-dinitrochlorobenzene in alcohol gave 2-amino-2':4'-dinitrodiphenyl sulphide (I), which after acetylating was oxidised to the sulphone. I was diazotised and coupled to β-naphthol, giving an orange pigment, m.p. 248° C. C. H. R.

Syntheses with the Aid of Lithiopyridines—Preparation of Dipyridyl Ketones, Pyridylphenylcarbinols, and Tripyridylcarbinols. J. P. Wibaut, A. P. Jonge, H. G. P. van der Voort, and P. P. H. L. Otto. *Rec. Trav. chim.*, **70**, 1054–1066 (Dec. 1951).

2-Lithiopyridine and the 3-compound, obtained from the corresponding bromopyridine and butyllithium, with benzoic anhydride, ethyl benzoate, and benzonitrile gave the corresponding pyridyl phenyl ketone, which reacted further with lithiopyridine giving a dipyridylphenylcarbinol. 2-Lithiopyridine with 2-cyanopyridine or ethyl picolinate gave 2:2'-dipyridyl ketone, which reacted further giving 2:2':2''-tripyridylcarbinol. The 3-lithio compound with 3-cyanopyridine or ethyl nicotinate gave the corresponding 3-compounds. The tripyridylcarbinols exhibited no halochromism with strong acid. C. H. R.

Reactions with Benzoxanthones. A. Mustafa and M. K. Hilmy. *J.C.S.*, 1343–1345 (April 1952).

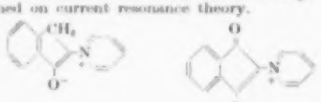
The preparation and the thermochromic behaviour of di-3:4- and di-1:2-benzoxanthylidenes (I and II) are described. I is pale yellow at room temperature, and green when molten, giving a bluish-green solution in warm anisole; whereas II forms yellowish-green crystals, melts to an olive-green liquid, and its solution in anisole is more weakly thermochromic than I. I and II are cleaved by sulphur at 270° C. to 3:4- and 1:2-benzoxanth-9-thione, and by oxalyl chloride, followed by water, to the corresponding benzoxanthones. Reduction of xanthones, thioxanthone, and the two benzoxanthones with excess lithium aluminium hydride gives the corresponding methanes.



(I) (II) H. H. H.

Two Enol Betaines of the Indane-pyridinium Series. W. H. Stafford. *J.C.S.*, 580–583 (Feb. 1952).

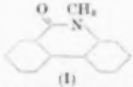
The enol betaine (I), 1-(3-hydroxyinden-2-yl)pyridinium hydroxide anhydro-salt, is obtained as an orange crystalline hydrate by the action of dil. NaOH on an aqueous solution of 1-(3-hydroxyinden-2-yl)pyridinium bromide. By crystallisation from aqueous methanol and ethanol under a variety of conditions, I gives a series of hydrates whose colour becomes less intense as the degree of hydration increases. The yellow enol betaine (II), 1-(1-keto-3-hydroxyinden-2-yl)pyridinium hydroxide anhydro-salt, is obtained directly by the action of alkali on the water-soluble product from the bromination of indane-1:3-dione in pyridine solution. The colours of these compounds are explained on current resonance theory.



(I) (II) H. H. H.

Internuclear Cyclisation. III—An Extension of the Pschorr Phenanthrene Synthesis to the Synthesis of Phenanthridones. R. A. Heacock and D. H. Hey. *J.C.S.*, 1508–1513 (April 1952).

Diazonium salts are prepared from *o*-amino-*N*-methylbenzanilide and converted into *N*-methylphenanthridone (I) by eight methods, in which *o*-hydroxy-*N*-methylbenzanilide is frequently a by-product. The diazonium borofluoride of the isomeric *o'*-amino-*N*-methylbenzanilide, when decomposed under acetone with copper powder, also gives I in 31% yield, but the product is more highly coloured.



(I) H. H. H.

Cleavage of Methin Linkings of Cyanine Dyes. I—Preparation of Unsymmetrical Cyanine Dyes. T. Ogata and M. Noguchi. *J. Sci. Research Inst.* (Tokyo), **45**, 154–160 (1951): *Chem. Abs.*, **46**, 2936 (10 April 1952).

Heating kryptocyanines or other trimethincyanines with aromatic quaternary ammonium halides containing active CH_3 groups in presence of a solvent such as pyridine, piperidine, acetone, or acetic acid leads to replacement of one of the aromatic nuclei of the trimethincyanine and formation of an unsymmetrically constituted compound of the same type. C. O. C.

Properties of Sensitising Dyes. J. Doležal and J. Schlemmer. *Chemie* (Prague), **3**, 51–54 (1948): *Chem. Abs.*, **46**, 2806 (25 March 1952).

Spectrograms of polymethin dyes show that lengthening of the polymethin chain shifts the absorption maximum to the red portion of the spectrum, presence of an amino group in both perichromes leads to halochromy, a cyclic structure increases resistance to hydrolysis, and suitable anions or CH_3 groups near the perichrome influence solubility. C. O. C.

Chemotherapeutic Dyes. IV—Phenoxazines and Benzo[*a*]phenoxazines. R. C. Clapp, J. H. Clark, J. P. English, C. E. Fellows, R. E. Grotz, and R. G. Shepherd. *J. Amer. Chem. Soc.*, **74**, 1989–1993 (20 April 1952).

5-Arylimino-9-dialkylaminobenzo[*a*]phenoxazines (dyes of the Nile Blue type) are active against mouse tuberculosis. Derivatives obtained by (*a*) introduction of 6-methyl, (*b*) introduction of 10-chloro, (*c*) introduction of 5- and 9-monoarylimino and 5-arylimino-9-arylamino, and (*d*) removal of the benzo group to give analogously substituted phenoxazines were not as active as the unmodified parent compounds. Their synthesis is described. C. O. C.

Chemotherapeutic Dyes. V—Benzo[*a*]phenothiazines and Benzo[*a*]phenazines. R. C. Clapp, J. P. English, C. E. Fellows, J. Forsythe, R. E. Grotz, and R. G. Shepherd. *J. Amer. Chem. Soc.*, **74**, 1994–1996 (20 April 1952).

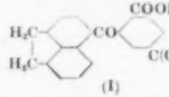
Synthesis of three 9-dialkylamino-5-arylimmobenzo[*a*]-phenothiazines and 9- and 10-diethylamino-5-phenyliminobenzo[*a*]phenazine is described. C. O. C.

Newer Dyes—IV. W. Seidenfaden. *Melliand Textilber.*, **33**, 218–221 (March 1952).

A review of some recent patents relating to anthraquinone acid dyes and to wool dyes that do not fall in the categories already considered. A. E. S.

New Intermediates and Dyes. III—Condensation of 4-*tert.*-Butylphthalic Anhydride with Acenaphthene. 6-*tert.*-Butylquinizarin and Derived Cellulose Acetate Dyes. B. W. Larner and A. T. Peters, *J.C.S.*, 1368–1373 (April 1952).

The carbonyl group *meta* to the *tert.*-butyl group in 4-*tert.*-butylphthalic anhydride reacts with acenaphthene in the Friedel–Crafts reaction, to give mainly 3-(5-*tert.*-butyl-2-carboxybenzoyl)acenaphthene (I), which does not isomerise in conc. H_2SO_4 and on decarboxylation with a trace of copper bronze in quinoline affords 3-*m*-*tert.*-butylbenzoylacenaphthene. 6-*tert.*-Butylquinizarin has been synthesised from the anhydride by a variety of methods, and has been converted into magenta and blue dyes for cellulose acetate rayon. *tert.*-Butyl-phenolphthalein, -fluorescein, and -eosin are described.



(I) H. H. H.

Polarographic Reduction of Hydroxy- and Methoxyanthraquinones. L. A. Wiles. *J.C.S.*, 1358–1362 (April 1952).

In strongly acid ethanol solution, the methyl ethers of many hydroxyanthraquinones are either reducible, or not so, at the dropping-mercury electrode, and this division into two well marked classes is accounted for structurally. Under similar conditions, hydroxyanthraquinones do not exhibit such a clearly defined classification. In alkaline solution all hydroxy- and methoxy-anthraquinones are reducible. The use of polarography is recommended for configurational work. H. H. H.

1-*o*-Methoxyphenylanthraquinone. E. A. Braude and J. S. Fawcett. *J.C.S.*, 1528–1530 (April 1952).

Reaction of *o*-methoxyphenylmagnesium bromide with crotonaldehyde gives *o*-methoxyphenylpropenylcarbinol, which undergoes oxotropic rearrangement to *o*-methoxystyrylmethylcarbinol on treatment with dilute mineral acid and dehydration to 1-*o*-methoxyphenylbuta-1:3-diene on distillation with $KHSO_4$. Reaction of this diene with 1:4-naphthaquinone in ethanol at room temperature affords the Diels–Alder adduct, which, when treated in hot alkaline solution, gives a mixture of 1-*o*-methoxyphenylanthraquinone and 1-*o*-methoxyphenyldihydroanthraquinone; these are separated by treatment with hot methanol, in which the former is soluble and the latter insoluble. The anthraquinone is reduced to 1-*o*-methoxyphenyl-9-anthrone by hot aqueous alkaline sodium dithionite (hydrosulphite). H. H. H.

Sulphenic and Selenenic Acids and their Derivatives. I—Esters of Selenenic Acid. W. Jenny. *Helv. Chim. Acta*, **35**, 845–851 (May), 1435 (June 1952).

Whereas the sulphenic esters $R^1{\cdot}S{\cdot}O{\cdot}R^2$ are relatively easily accessible products, the analogous selenium compounds $R^1{\cdot}Se{\cdot}O{\cdot}R^2$ have not yet been prepared. It is now shown that alcohols react with anthraquinonyl-1-selenyl acetate to give the corresponding selenenic esters, and the properties of the methyl, ethyl, *iso*propyl, and *n*-butyl esters are described. H. H. H.

Synthesis of Benzanthrone and its Derivatives used for Dyes. I—Benzanthrone. E. Chubachi, M. Ōkawa, and I. Tanakadate. *Rept. Govt. Chem. Ind. Research Inst. Tokyo*, **45**, 311–330 (1950): *Chem. Abs.*, **46**, 2805 (25 March 1952).

1-Benzoylnaphthalene (I) was synthesised in three ways—(1) Naphthalene (4 mol.) and benzoyl chloride (1) were heated for 4 hr. at 200°C., using P_2O_5 as catalyst; Na_2CO_3 was added to neutralise the P_2O_5, and the mixture distilled at 10 mm. to give a 90% yield of I (83% 1-isomer, 17% 2-isomer). (2) 1-Benzylnaphthalene (obtained by treating naphthalene with benzyl chloride in presence of

aq. $ZnCl_2$) was boiled with 20% HNO_3 to give a 95–97% yield of I. (3) o-1-Naphthoylbenzoic acid was decarboxylated at 200–250° C. in presence of $CuCl_2$ to give an 87% yield of I. A 67·4% yield of benzanthrone was obtained by heating I (50 parts) with anhydrous $AlCl_3$ (150) for 3 hr. at 140° C. and a further 3 hr. at 140° C. with dry air passing through at 300 c.c./min. C. O. C.

Reactivity of the Carbonyl Group in *meso*Benzanthrone. N. Campbell and A. A. Woodham. *J.C.S.*, 843–847 (March 1952).

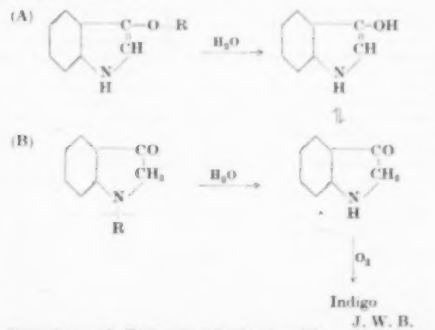
The reaction of the CO group in *meso*benzanthrone with hydroxylamine is sluggish, since heating it with the hydrochloride of the latter in pyridine for 8 hr. gave little or no oxime, whereas for 20 and 70 hr. the yields of oxime were 30–50 and 80%, respectively. Attempts to see whether the CO group is reduced to CH·OH by aluminium *iso*propoxide (Meerwein–Ponndorf reagent) unexpectedly resulted in complete removal of oxygen to give *meso*benzanthrene in good yield, which provides the best method for the synthesis of this hydrocarbon and of the 3-chloro- and 3-bromo-*meso*benzanthrenes. The basic properties of the CO group are reflected in the formation of oxonium salts with conc. H_2SO_4 and with trichloroacetic acid (identified by the Kofler "contact method"), while with PCl_5 and $POCl_3$ dinuclear products are formed. H. H. H.

Occurrence of Direct Hydroxylation and Self-condensation in the Action of Potassium Hydroxide on Three Isomeric Benzo Derivatives of *meso*Benzanthrone. W. Bradley and F. K. Sutcliffe. *J.C.S.*, 1247–1251 (April 1952).

The 5:6-benzo derivative of *meso*benzanthrone readily reacts with a solution of potassium hydroxide and potassium acetate in ethanol under reflux at 110° C. to give 4-hydroxy-5:6-benzo*meso*benzanthrone, and with a melt of potassium hydroxide and potassium acetate at 220–230° C. to give 6:7-8:9-dibenzoviolanthrone. The 10:11-benzo derivative undergoes self-condensation to 1:2-10:11-dibenzo*iso*violanthrone under the above conditions at 110° C., whereas the 8:9-benzo compound, which is the least reactive of the isomers, requires 220–230° C. for the formation of 3:4-11:12-dibenzoviolanthrone, only a small proportion of hydroxylation occurring. The relation between the hydroxylation and the self-condensation reactions is discussed. H. H. H.

New Principle for the Histochemical Location of Hydrolytic Enzymes [by Indigo Formation]. S. J. Holt. *Nature*, **169**, 271–273 (16 Feb. 1952).

Indoxyl derivatives are used to study the distribution of hydrolytic enzymes in animal tissues; any enzyme which catalyses A or B will, in presence of air, induce indigo formation—

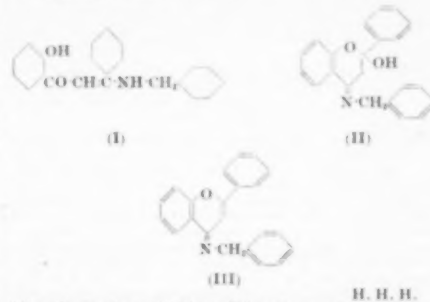


Indigo

J. W. B.

Reaction of Primary Amines with *o*-Hydroxydibenzoylmethanes, and the Preparation of Derivatives of Flavone Imine. W. Baker, J. B. Harborne, and W. D. Ollis. *J.C.S.* 1294–1302 (April 1952).

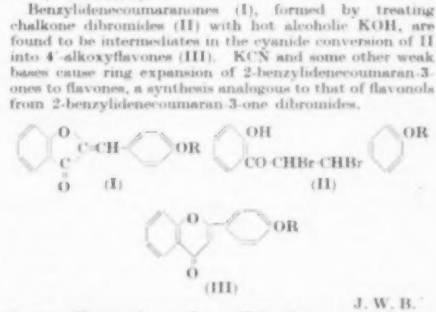
Reaction of benzylamine with 3-benzoylflavone gives *N*-benzylbenzamide and the yellow fluorescent 2-*β*-benzylaminocinnamoylphenol (I), but with *o*-hydroxydibenzoylmethane the main product is the colourless, non-fluorescent isomeric 2-hydroxyflavanone benzylimine (II). The latter is readily dehydrated under acid conditions to give flavone benzylimine (III), which resists acid hydrolysis. The flavone imines may also be prepared by reaction of 4-thionflavone, or more readily 4-thionflavone methiodide, with primary bases.



H. H. H.

Ring Expansion of 2-Benzylidenecoumaran-3-ones—A Synthesis of Flavones. D. M. Fitzgerald, E. M. Philbin, and T. S. Wheeler. *Chem. and Ind.*, 130 (9 Feb. 1952).

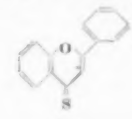
Benzylidenecoumaranones (I), formed by treating chalkone dibromides (II) with hot alcoholic KOH, are found to be intermediates in the cyanide conversion of II into 4-alkoxyflavones (III). KCN and some other weak bases cause ring expansion of 2-benzylidenecoumaran-3-ones to flavones, a synthesis analogous to that of flavonols from 2-benzylidenecoumaran-3-one dibromides.



J. W. B.

Some Properties of 4-Thionflavone and its Methiodide, and of 4-Thionchromones. W. Baker, J. B. Harborne, and W. D. Ollis. *J.C.S.*, 1303–1309 (April 1952).

4-Thionflavone (I), prepared from flavone and phosphorus pentasulphide, is slowly hydrolysed by acids to flavone, and reacts with hydroxylamine on heating to give flavone oxime; the methiodide is much more reactive and affords the oxime, hydrazone, and semicarbazone of flavone with the appropriate reagents, while being hydrolysed by water to flavone. The previously described "flavone oxime", prepared from flavone, is shown to be an *iso*oxazole, and "phenylhydrazones" derived from some 4-thionchromones are proved to be pyrazoles.



(I)

H. H. H.

Solubilisation of Dyes in Mineral Oil and its Application to a Model Biological Cell Membrane. S. Ross. *J. Colloid Sci.*, **6**, 497–507 (1951); *Chem. Abs.*, **46**, 2878 (10 April 1952).

The solubility at 25° C. in highly refined mineral oil was determined of FD&C—Blue No. 1 and 2; Green No. 1, 2, and 3; Orange No. 1; Red No. 1, 2, 3, and 4; Yellow No. 1, 5, and 6—in presence of 1% (on the weight of the oil) of Span 20 (sorbitan monolaurate), Span 85 (sorbitan trioleate), glyceryl oleate, G–954 (mannitan mono-oleate),

(*J.* 2000 (mannitan monopalmitate), Tween 81 (polyoxyethylenesorbitan mono oleate), Arlocel B (mannitan monooleate), and Amine soap (dibutylamine oleate). The solubility was a primary function of the physicochemical behaviour of the surface-active agent and was much less dependent on dye structure. The kind and amount of micelles in these solutions represent an equilibrium that changes with concentration of both surface-active agent and dye. C. O. C.

Melanin and its Precursors. IV—Synthesis of β-3:4-Dihydroxy-2- and -5-methylphenylalanine. R. I. T. Cromartie and J. Harley-Mason. *J.C.S.*, 1052–1053 (March 1952).

Solubility of Carotene in Vegetable Oils. A. A. Mikhaylovnina and B. G. Savinov. *Ukrain. Khim. Zhur.*, **16**, 183–187 (1950); *Chem. Abs.*, **46**, 2748 (25 March 1952).

Carotene readily forms supersaturated solutions in vegetable oils, the solubilities being approx. the same for different oils at the same temperature. C. O. C.

Reversible Photobleaching of Chlorophyll in Rigid Solvents. H. Linschitz and J. Rennert. *Nature*, **169**, 193–194 (2 Feb. 1952).

Reversible spectral changes are studied in irradiated chlorophyll *a* in a rigid solvent at liquid nitrogen temp. Changes in deoxygenated rigid chlorophyll soln. containing quinones or imines are much more marked, and if produced by red light irradiation persist until the solvent is melted. It is suggested that the colour change is due to transfer of an electron or H atom from the pigment to the solvent. J. W. B.

Cinchodectonic Acid. O. Ribeiro and W. B. Mors. *Anais Assoc. quim. Brasil*, **9**, 182–189 (1950); *Chem. Abs.*, **46**, 2532 (25 March 1952).

Cinchodectonic acid, obtained by extracting the bark of the Bolivian cinchona with acetone, is soluble in water and ordinary organic solvents (except petroleum ether) to red solutions. It is probably an anthraquinonecarboxylic acid with the OH group in α-position to the quinoidic group. It forms lakes with Pb, Cu, Fe, and Zn. C. O. C.

Lichens and Fungi. I—Polyporic Acid in *Stictæ*. J. Murray. *J.C.S.*, 1345–1350 (April 1952).

The lichens *Stictæ coronata* and *S. colensoi*, on extraction with acetone, yield principally polyporic acid, calycin, pulvinic lactone, and neutral substances; the former species also contains pulvinic acid, two red quinonoid pigments, a phenol, and other substances. Polyporic acid is likewise the main pigment of the fungus *Pseudophora filamentosa*. It should be noted that polyporic acid cannot be distinguished by simple colour tests from thelephoric acid, a phenanthraquinone pigment occurring in several members of the allied genus *Thelephora*. H. H. H.

Roasting of the Ultramarine Mix. A. N. Agte, R. I. Libina, A. D. Miller, and A. P. Musakin. *J. Appl. Chem. U.S.S.R.*, **24**, 1317–1321 (Dec. 1951).

Crystallised Tungsten Blue Compounds—Hydrogen Analogues of Tungsten Bronzes, H_xWO_3. O. Glemser and C. Naumann. *Z. anorg. allg. Chem.*, **265**, 288–302 (1951); *Chem. Abs.*, **46**, 3440 (25 April 1952).

Tungsten Blue is not a single compound or reduction stage but is composed of blue oxide and blue hydroxide. $W_{10}O_{29}$ is the solitary definite blue oxide. Reduction of WO_3 with nascent H gives $H_{0.3}WO_3$, which crystallises in the ReO_3-type with $a = 3{\cdot}75$ Å. (minimum distortion). It is the H analogue of the cubic Tungsten Bronzes Na_xWO_3 ($x = 0{\cdot}3$–$1{\cdot}0$). Other H analogues of Tungsten Bronzes are the blue tetragonal $H_{0.23}WO_3$ and the blue rhombic $H_{0.4}WO_3$. C. O. C.

Potassium and Sodium Tungsten Bronzes. M. E. Straumanis, S. C. D. Gupta, and C. H. Ma. *Z. anorg. allg. Chem.*, **265**, 209–219 (1951); *Chem. Abs.*, **46**, 3479 (25 April 1952).

Preparation and constitution are described, the bronze with the least possible WO_3 content being $K_{0.4}WO_3$. C. O. C.

PATENTS

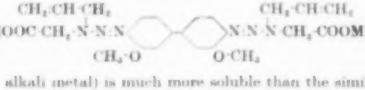
2:5-Dialkoxy-4-cyanoacetoacetanilides—Azo Coupling Components. General Aniline. *USP* 2,559,181

2:5-Dialkoxy-4-cyanoacetoacetanilides give orange and yellow pigments when coupled with suitable diazo compounds in substance or on textile fibres. Thus 4-cyano-2:5-dimethoxyaniline is condensed with ethyl acetoacetate in boiling xylene to give—

which couples with diazotised 2-amino-5-chlorotoluene to give a fast-to-light greenish-yellow pigment. E. S.

Diazoamino Compound from Tetrazotised Dianisidine and *N*-Allylglycine—Azoic Diazo Component. American Cyanamid Co. *USP* 2,572,916

The diazoamino compound from tetrazotised dianisidine and *N*-allylglycine—



(M = alkali metal) is much more soluble than the similar compounds prepared from *N*-alkylglycines, and so may be used for making conc. azoic printing solutions in admixture with suitable coupling components. Thus, all parts being by weight, the disodium salt of the diazoamino compound (1110), 2-hydroxy-3-naphthanilide (1189), KOH (504) as 50% aq. soln., and ethylene glycol (3000) are dissolved in water (to 10,000) to give a solution which does not crystallise when stored at low temperatures. E. S.

5-Acyloxypyrazole Colour Formers. DuP. *USP* 2,575,182

Compounds of formula—

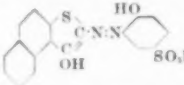
(Y = CO or SO_2; Z-Y = acyl; R^1 = subst. or unsubst. Ar or a heterocyclic radical joined to the N atom through a C atom; R^2 = a univalent hydrocarbon nucleus or R^1) are colour formers for photographic dye images. C. O. C.

Brown Stilbene Azo Dyes for Leather. Ciba. *BP* 669,706

4:4′-Dinitrostilbene-2:2′-disulphonic acid is condensed under alkaline conditions with diaminoazo compounds $HO_3S{\cdot}R^1{\cdot}N:N{\cdot}R^2(NH_2)_2$ (R^1 and R^2 = aryl of the benzene or naphthalene series) to give browns which dye level on chrome-tanned leather. One mol. of 4:4′-dinitrostilbene-2:2′-disulphonic acid may be condensed with 2 mol. of the same diaminoazo compound or with 1 mol. each of two different diaminoazo compounds, or with 1 mol. of the diaminoazo compound and 1 mol. of a primary aromatic amine, e.g. *m*-nitroaniline. Or the quantities of components to be condensed need not be in simple molecular proportions. The condensation leads to formation of azo or azoxy links. Thus 1 mol. of the diaminoazo compound 1-naphthylamine-5-sulphonic acid→*m*-phenylenediamine is refluxed for 15 hr. with 1 mol. of 4:4′-dinitrostilbene-2:2′-disulphonic acid in presence of dil. NaOH. The product, which is isolated by neutralisation and salting out, dyes chrome leather full red-brown. E. S.

Metallisable Monoazo Dyes from 3-Hydroxybenzothionaphthen. General Aniline. *USP* 2,560,502

3-Hydroxybenzothionaphthens (i.e. 3-hydroxynaphthothiophens) coupled with diazotised *o*-aminophenolsulphonic acids or -sulphonamides give dyes which may be metallised in substance or on the fibre, and are of better fastness than similar dyes prepared from 3-hydroxythionaphthens. Thus diazotised 2-aminophenol-4-sulphonic acid is coupled with 3-hydroxy-4:5-benzothionaphthen to yield—



which gives blue-black afterchrome dyeings on wool. E. S.

Metallisable Azo Dyes from Diarylides of Malonic Acid. American Cyanamid Co. *USP* 2,556,743

Diarylides of malonic acid couple with appropriate diazo compounds to yield dyes of formula—

$$R^1{\cdot}N{:}N{\cdot}CH(CO{\cdot}NHR^2){\cdot}CO{\cdot}NHR^1$$

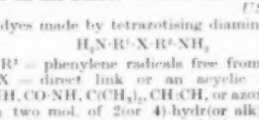
(R^1 = the residue of a diazotisable amine with a metallisable group *ortho* to the azo link; R^1 and R^2 = subst. or unsubst. aryl of the benzene or naphthalene series), which form stable metal complexes, in substance or on the fibre, although their structure seems to have only one metallisable group *ortho* to the azo link. Thus diazotised 2-amino-4-chlorophenol-6-sulphonic acid is coupled with malondianilide dissolved in pyridine, in presence of NaOH, and the product precipitated by addition of conc. HCl. It dyes wool greenish yellow from an acid bath, or red-orange by afterchrome or metachrome processes. It may be chromed in substance by refluxing with chromium acetate in presence of formic acid; the chrome complex so produced gives level, bright oranges on wool. E. S.

Direct Cotton Dyes for Diazotisation and Development on the Fibre. General Aniline. *USP* 2,563,381

Disazo dyes made by tetrazotising diamines—

$$H_2N{\cdot}R^1{\cdot}X{\cdot}R^2{\cdot}NH_2$$

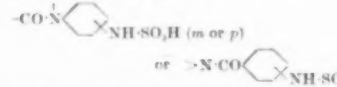
(R^1 and R^2 = phenylene radicals free from COOH and SO_3H; X = direct link or an acyclic bridge, e.g. NH·CO·NH, CO·NH, $C(CH_3)_2$, CH:CH, or azoxy) and coupling with two mol. of 2(or 4)-hydr(or alk)oxy-6(or 7)-naphthylsulphamic acid are water-soluble and substantive towards cellulosic fibres. By treatment with nitrous acid on the fibre, under mildly acid conditions, the β-sulphamic acid groups are readily converted to diazo groups, whereas similar dyes with α-sulphamic acid groups require more strongly acid conditions. Development with β-naphthol, 3-methyl-1-phenyl-5-pyrazolone, or *m*-toluylenediamine then gives dyeings of good wet fastness. Thus the disazo dye—



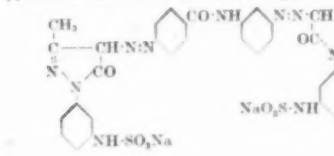
gives blue on cotton. By treatment with a solution containing 0·75 g. $NaNO_2$ and 1·25 g. conc. H_2SO_4 per litre, followed by development with alkaline β-naphthol, a violet of high wash-fastness is obtained.

USP 2,571,990

Similar dyes, with terminal phenylsulphamic acid groups, which give diazo compounds when treated on the fibre with nitrous acid, are made by coupling tetrazotised diamines $H_2N{\cdot}R^1{\cdot}X{\cdot}R^2{\cdot}NH_2$ with coupling components containing the grouping—



Or dyes which behave in the same way are made by coupling 2 mol. of diazotised *m*- or *p*-aminophenylsulphamic acid with a coupling component containing the grouping –CO·NH·R^1·X·R^2·NH·CO– (e.g. *NN'*-bisacetoacetyl-o-tolidine). Those dyes in which the azo group or the C atom of the –N·CO– is *meta* to the –NH·SO_3H, or in which the N atom of the –N·CO– is *meta* or *para* to the –NH·SO_3H, are preferred, because they yield diazo compounds on the fibre under mildly acid conditions. Thus by coupling tetrazotised *N*-*p*'-aminobenzoyl-*m*-phenylenediamine with 2 mol. of 3-methyl-1-*m*-sulphamidophenyl-5-pyrazolone in alkaline solution, the yellow dye—

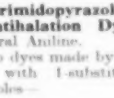


is formed. By treatment on the fibre with nitrous acid and development with β-naphthol an orange is produced.

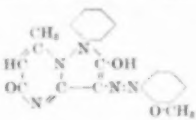
E. S.

Azo Dyes from Pyrimidopyrazoles—Photographic Filter and Antihalation Dyes, and Colour Formers. General Aniline. *USP* 2,569,418

Monoazo and disazo dyes made by coupling diazo and tetrazo compounds with 1-substituted 2:5-diketo-7-methylpyrimidopyrazoles—



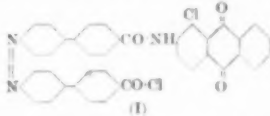
(R = alkyl, aryl, aralkyl, or a heterocyclic radical, e.g. benzothiazolyl, α-pyridyl, etc.) are colour formers, and filter and antihalation dyes in photographic film. These coupling components are made, as described in *USP* 2,481,466 (cf. *J.S.D.C.*, **66**, 242 (1950)), by heating the corresponding 1-substituted 3-amino-5-pyrazolone with 1·0–1·5 mol. of diketen. Thus, by coupling diazotised *o*-anisidine with 2:5-diketo-7-methyl-1-phenylpyrimidopyrazole in presence of methanol, the yellow dye—



is produced. E. S.

Anthraquinonoid Vat Dyes and Intermediates derived from Azodiphenyl-4:4'-dicarboxylic Acid. DuP. *USP* 2,559,667

Glucose–NaOH reduction of 4-*p*-nitrophenylbenzoic acid gives azodiphenyl-4:4'-dicarboxylic acid, which is converted to its acid chloride and condensed with 1 mol. of a halogeno-2-aminoanthraquinone to give vat dye intermediates. Thus with 2-amino-1-chloroanthraquinone suspended in nitrobenzene in presence of pyridine the compound—

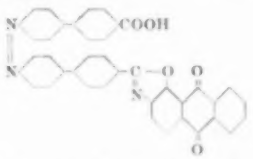


(I)

is formed. The CO·Cl group may be converted into CO·OAlk, COOH, or CO·NH_2.

USP 2,559,668

The amides obtained by condensing 1 mol. of azodiphenyl-4:4'-dicarboxylic acid chloride with 1 mol. of a 2-amino-1-halogeno(or mercapto)anthraquinone are cyclised to oxazole (or thiazole) compounds, which are yellow vat dyes. Thus with 2-amino-1-chloroanthraquinone, cyclising in nitrobenzene at 210°C. with Na_2CO_3 and potassium acetate in presence of Cu_2Cl_2 and cupric acetate, the oxazole—

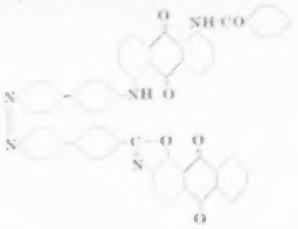


is formed. It dyes cotton bright yellow from a red-brown vat.

USP 2,559,669

The amides obtained by condensing 1 mol. of azodiphenyl-4:4'-dicarboxylic acid chloride with 1 mol. of a 2-amino-1-halogenoanthraquinone are further condensed with 1 mol. of an aminoanthraquinone. Ring-closure to the oxazole is then effected as in *USP* 2,559,668 (above);

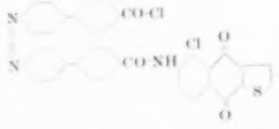
the products are yellow to orange vat dyes. Thus, by condensing 1 with 1-amino-5-benzoylaminoanthraquinone in nitrobenzene at 210° C. in presence of pyridine, and then cyclising, the yellow vat dye—



is formed.

USP 2,559,670

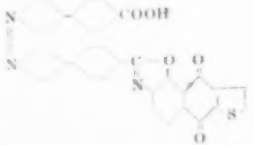
Aminothiophanthraquinones condense with azodiphenyl-4,4′-dicarboxylic acid chloride, in equimolecular proportions, to yield amides which are intermediates for vat dyes. Thus 6-amino-5-chlorothiophanthraquinone heated in o-dichlorobenzene with azodiphenyl-4,4′-dicarboxylic acid chloride gives



The CO·Cl group may be converted into COOH, COOAlk, or CO·NH$_2$.

USP 2,559,671

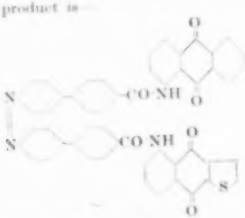
The amides obtained by condensing 1 mol. of azodiphenyl-4,4′-dicarboxylic acid chloride with 1 mol. of an o-aminohalogenothiophanthraquinone are treated with water, alcohol, ammonia, or a simple amine to convert the CO·Cl to COOH, COOAlk, or an amide group, and then cyclised to oxazole compounds, which are yellow vat dyes. Thus, using 6-amino-5-chlorothiophanthraquinone, treating with water to convert the COCl to COOH, and finally cyclising, the oxazole—



is produced.

USP 2,559,672

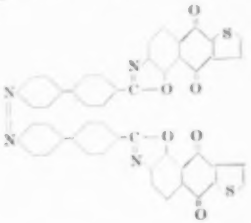
The amides obtained by condensing 1 mol. of azodiphenyl-4,4′-dicarboxylic acid chloride with 1 mol. of an aminothiophanthraquinone are further condensed with 1 mol. of an aminoanthraquinone or aminothiophanthraquinone to produce diamides which are yellow vat dyes. Thus on condensing first with 1 mol. of 5-aminothiophanthraquinone and then with 1 mol. of 1-aminoanthraquinone the product is—



which gives yellow on cotton from an orange vat.

USP 2,559,673

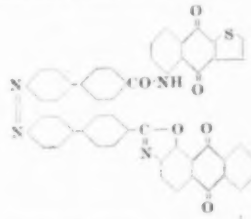
Azodiphenyl-4,4′-dicarboxylic acid chloride is condensed with 2 mol. of an o-halogeno(or hydroxy or mercapto)-aminothiophanthraquinone, or with 1 mol. of such a compound and 1 mol. of an o-halogeno(or hydroxy or mercapto)aminoanthraquinone. Ring closure is then effected to produce vat dyes containing two oxazole or thiazole groups, or one oxazole and one thiazole group. Thus, on using 2 mol. of 6-amino-5-chlorothiophanthraquinone, the product is—



which gives yellow on cotton from an orange vat.

USP 2,559,674

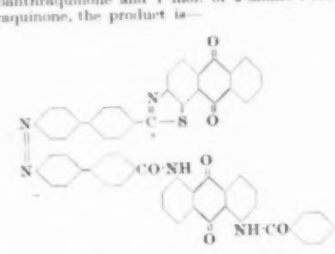
Vat dyes with only one oxazole or thiazole group are made by condensation of azodiphenyl-4,4′-dicarboxylic acid chloride with 1 mol. of an o-halogeno(or hydroxy or mercapto)aminothiophanthraquinone and 1 mol. of an aminothiophanthraquinone or aminoanthraquinone unsubst. *ortho* to the amino group, followed by ring closure. Or, 1 mol. of an o-halogeno(or hydroxy or mercapto)-aminoanthraquinone and 1 mol. of an aminothiophanthraquinone unsubst. *ortho* to the amino group may be employed. Thus on condensation of azodiphenyl-4,4′-dicarboxylic acid chloride with 1 mol. of 5-aminothiophanthraquinone and 1 mol. of 2-amino-1-chloroanthraquinone, followed by ring closure, the product is—



which gives bright yellow on cotton from an orange vat.

USP 2,559,675

Vat dyes containing two anthraquinone residues and one thiazole ring are made by condensing azodiphenyl-4,4′-dicarboxylic acid chloride with 1 mol. of a suitable aminoanthraquinone (which may carry simple substituents) and 1 mol. of a 2-amino-1-mercaptoanthraquinone, and then cyclising. Thus by using 1 mol. of 1-amino-5-benzoylaminoanthraquinone and 1 mol. of 2-amino-1-mercaptoanthraquinone, the product is—



which gives bright yellow on cotton from a dull violet vat.

E. S.

Condensation Products of Naphthaquinoneimines and Aminoazo Compounds—Dyes for Cellulose Esters and Superpolyamides. S. *BP* 670,969

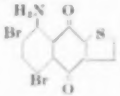
Naphthaquinoneimine compounds and their halogenated derivatives of *BP* 606,008 and 629,706 (*J.S.D.C.*, **65**, 33 (1949); **66**, 156 (1950)) are condensed with aminoazo compounds to give dischargeable blue, green, and brown dyes for cellulose acetate and nylon, fast to light and gas fumes. Thus 5-amino-8-hydroxy-1:4-naphthaquinoneimine is heated at 100°C. for 2 hr. in acetic acid with 4-aminoazobenzene. R. K. F.

1:10-Phenanthroline. Gy. *BP* 668,960

Yields of 30–60% of 1:10-phenanthroline are obtained by condensing *o*-phenylenediamine or 8-aminoquinoline with glycerol in presence of H_2SO_4, a dehydrogenating agent, and a copper salt, the phenanthroline being separated as its Cu complex. Thus *o*-phenylenediamine, glycerol, arsenic acid, and $CuSO_4.5H_2O$ are heated at 130–140°C. in conc. H_2SO_4. The copper compound which separates on pouring into water is decomposed by gradually adding aq. Na_2S. R. K. F.

Aminohalogenothiophanthraquinones—Dyes for Cellulose Esters and Superpolyamides. DuP. *USP* 2,559,677

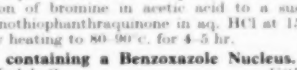
Thiophanthraquinones carrying an amino group in the benzene nucleus are brominated or chlorinated to produce yellow to red dyes for cellulose acetate and nylon. The products are also useful intermediates for vat and wool dyes. Thus the compound—



which dyes cellulose acetate pink, is made by adding a solution of bromine in acetic acid to a suspension of 8-aminothiophanthraquinone in aq. HCl at 15–20°C. and finally heating to 80–90°C. for 4–5 hr. R. K. F.

Dyes containing a Benzoxazole Nucleus. Eastman Kodak Co. *USP* 2,575,018

Dyes of formula—

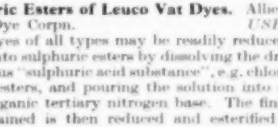


(R^1 = primary Alk; R^2 = aromatic nucleus of the benzene series; Z = atoms to complete a heterocyclic nucleus of the benzoxazole series) are photographic sensitisers of good solubility in the solvents normally used. C. O. C.

Sulphuric Esters of Leuco Vat Dyes. Allied Chemical & Dye Corpn. *USP* 2,575,463

Vat dyes of all types may be readily reduced and converted into sulphuric esters by dissolving the dry dye in an anhydrous "sulphuric acid substance", e.g. chlorosulphonic acid or esters, and pouring the solution into excess of a liquid organic tertiary nitrogen base. The finely divided dye obtained is then reduced and esterified while still suspended in the precipitating medium. C. O. C.

Asymmetric Photographic Sensitising Dyes. Haloid Co. *USP* 2,578,677



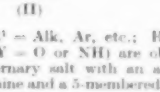
(I)

(II)

Dyes of formula I (R^1 = Alk, Ar, etc.; R^2, R^3, R^4, and R^5 = H or Alk; Y = O or NH) are obtained by mixing a suitable quaternary salt with an aliphatic or saturated heterocyclic amine and a 5-membered compound of formula II. C. O. C.

Methin Dyes containing a 3-Aryl-4-thiazolidine Nucleus. Kodak. *BP* 671,346

Dyes of formula—



(Alk of 1–4 C; X = an anion; Z = atoms to complete a benzothiazole, benzoselenazole, α- or β-naphthothiazole, quinoline, thiazoline, thiazole, or 3:3-dimethylindolenine nucleus; *n* = 0 or 1) are useful for making more complex *merocyanine* dyes, complex dialkylaminobenzylidene dyes, and complex dyes of unknown constitution. C. O. C.

Dyes having a Substituted Methin Chain. Ilford. *BP* 670,998

Dyes of formula—

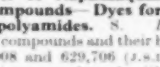
(D = residue of 5- or 6-membered heterocyclic nucleus; *n* = 0 or 1; R^1 and R^2 = Alk or aralkyl) are obtained by treating compounds of formula—

$$R^1{\cdot}O{\cdot}C(CH_3){\cdot}C(CN){\cdot}COOAlk$$

with an alkyl or aralkyl quaternary salt of a 5- or 6-membered heterocyclic nitrogen compound having a thioether group in α- or β-position to the quaternary N atom. C. O. C.

Azathiazolone Cyanine Dyes. General Aniline. *USP* 2,578,178

Dyes of formula—



(*n* = 0 or 1; R = subst. or unsubst. Alk, allyl, Ar, or aralkyl; X = an acid radical; Z = atoms to complete a heterocyclic nucleus) are useful as photographic sensitisers and as intermediates for tri- and tetra-nuclear dyes. C. O. C.

Spray-dried Disperse Dye Powders containing Lignin Sulphonate. Celanese Corpn. of America. *USP* 2,574,597

Disperse dye powders of an unusually high degree of dispersibility and freedom from non-dispersible particles are obtained by making an aqueous slurry containing the dye, lignin sulphonate, and a neutral or alkaline inorganic salt of a cation which does not form insoluble soaps, and then spray-drying the slurry at 212–300°F. so as to produce particles of 25–100 μ. C. O. C.

Carbon Black. Columbian Carbon Co. *BP* 670,863

A method of obtaining a better yield and improved quality of furnace black. C. O. C.

Furnace Blacks. Phillips Petroleum Co. *BP* 670,227

A method of adjusting the pH of furnace blacks so as to increase the scorch time and increase the hardness of pellets of the pigment. C. O. C.

Pelleting of Carbon Black. Phillips Petroleum Co. *BP* 670,980

Cadmium Sulphide Pigments. American Cyanamid Co. *USP* 2,578,363

High-quality cadmium yellow is obtained by treating a slurry of cadmium sulphide (prepared from $CdSO_4$ and alkali-metal sulphide) with an alkaline-earth metal sulphide or hydrosulphide. C. O. C.

Acyl Ureides—Water-repellent, Dispersing, and Wetting Agents, Dye Intermediates, etc. (III p. 266).

Electrophoresis of Pigments in Organic Solvents (V p. 276).

Fundamentals of Aluminium Paint (V p. 276).

Fastness of Cotton Dyeings (VIII p. 280).

Solubilisation of Sparingly Soluble Metal-complex Direct Cotton Dyes with Ammonia or Amines (VIII p. 281).

Improving the Printing Properties of Ester Salts of Leuco Vat Dyes (IX p. 282).

Dyes fast to Vulcanisation (XIII p. 286).

V—PAINTS; ENAMELS; INKS

Electrophoresis of Pigments in Organic Solvents. H. Brintzinger, R. Haug, and G. Sachs. *Farbe u. Lack*, **58**, 5–16 (1952): *Chem. Abs.*, **46**, 3770 (25 April 1952).

Suspensions in polar and non-polar solvents of fifteen inorganic and organic pigments were subjected to fields up to 2000 v./cm. in the Becker apparatus between Cr plated brass or Fe electrodes 0·5 cm. apart. Inorganic pigments had a predominant or "natural" negative charge; organic pigments were either predominantly positive (e.g. Lithol Rubine, Lacquer Red C, Heliogen Blue, and Red Extract R) or negative (e.g. Hansa Yellow G and 10 G, and Siegle Red 1), and this is thought to be related to their structure (e.g. o-sulphoazo compounds in the first group, o- or *m*-nitroazo compounds in the second group) or their history (e.g. Heliogen Blue is crystallised from H_2SO_4). The characteristic "dancing" and bridge-forming of pigments in non-polar solvents was absent when moisture was absent; air films caused bridge-formation of large agglomerates. The predominant charge of the pigments emerged more clearly as the dielectric constant of the solvent increased; the pigments deposited themselves on only one electrode, instead of unequally on both, when the solvent had dielectric constant > 5. All the pigments became positively charged in methyl, ethyl, and butyl alcohol and negatively charged in pure acetone, though some organic pigments remained positively charged in commercial acetone. Addition of 0·1–1·0% of wetting agents to pigment suspensions in non-polar solvents strongly affected the charge on the pigments. Thus the anion-active Basopal NA and Nekal BX gave all the pigments a positive charge, regardless of their natural charge. Lecithin caused very homogeneous deposition and suppressed dancing and bridge-formation but did not alter the charge. Germocid (cation-active), Texapon W, and Emulphor FM (anion-active), Emulphor A and O (non-ionic), and the silicone oils AL, DC 200, and DC 1107 made all inorganic pigments positive, but merely accented the natural charges of the organic pigments. Basopal NA eliminated mutual flocculation in pigment mixtures (e.g. lithopone and gas black in benzene or tetrahydronaphthalene, or ultramarine and Hansa Yellow in mineral spirit or benzene). C. O. C.

Fundamentals of Aluminium Paint. E. Schellier. *Amer. Paint J.*, **36**, (22), 82, 84–85, 88–89, 92–93 (1952): *Chem. Abs.*, **46**, 3769 (25 April 1952).

Description of the theories and fundamentals of Al as a pigment. C. O. C.

Printing Inks. C. C. Mill. *Chem. and Ind.*, 156–159 (23 Feb. 1952).

Properties, faults, and application of printing inks are discussed, together with their rheology, the interpretation of rheological data, and the application of rheological measurements in practice. J. W. B.

Zein Pigment Chips. C. J. McDowell and R. L. Clark. *Ind. Eng. Chem.*, **44**, 116–118 (Jan. 1952).

By compounding equal volumes of zein and pigment and 8–15% of a high-b.p. zein solvent in a two-roll rubber mill, in which one roll is maintained at ca. 80° C., a smooth sheet is obtained which is easily ground to a fine powder. The ground chip can be dissolved readily in zein solvents or dispersed in water, with the addition of resins and plasticisers as desired to form printing inks and coating compositions. Such solutions have lower viscosity and retain their initial viscosity better than conventional zein inks prepared by ball-milling or on triple-roll paint mills. Coatings and prints are also glossier and more transparent. The improved properties appear to be due to finer disintegration of the pigment particles and to their being coated with a film of zein. W. K. R.

PATENT

Non-flocculating Phthalocyanine-pigmented Cellulose Nitrate Coating Compositions. DuP. *BP* 670,190

Addition of not > 0·2% (on the weight of the composition) of ethyl or methyl cellulose or dynamite cellulose nitrate prevents the pigment from flocculating or separating out. In addition it helps the composition to retain uniform colour characteristics when wet and to yield a film free from flooding. C. O. C.

VI—FIBRES; YARNS; FABRICS

Recent Experiments and Concepts regarding the Mechanism of Deformation of Fibres. O. Kratky, G. Porod, and E. Treiber. *Z. Elektrochem.*, **55**, 481–490 (1951): *Chem. Abs.*, **46**, 2808 (25 March 1952).

An account of work with idealised models which give orientation of elongated particles on stretching. The X-ray diagrams obtained with regenerated cellulose required the assumption of lamellar or ribbonlike micelles, but this seemed to be contradicted by certain observed orientations. A model is suggested in which the micelles are joined to each other through laminar regions, so that relative rotation is possible only around a transverse axis parallel to the plane of the ribbon. This is illustrated in detail by diagrams. The mechanical properties of a system, in particular the extension under a given stress, are discussed in relation to this model. It is suggested that undesirable properties result when orientation can produce a torque in the hinges or when these joints between micelles are produced primarily by single molecules. 23 references. C. O. C.

Electrical Resistance of Textile Materials — A Literature Review. J. W. S. Hearle. *J. Textile Inst.*, **43**, P 194–P 223 (April 1952).

A survey of experimental methods of measuring electrical resistance of textiles covers electrode systems, conditioning arrangements, and methods of resistance measurement and the degree of accuracy to be expected. Methods of expressing results are followed by a discussion of the effects of — moisture and materials, salt content of processed materials, electrode system, temperature, voltage, polarisation; A.C. resistance, resistance distribution, and electrolytic effects are mentioned. Finally, theories of electrical resistance are considered. There are 61 references. J. W. B.

Prevention of Damage to Textiles by Sunlight. A. Sippel. *Textil-Praxis*, **7**, 220–223 (March 1952).

The fundamental principles involved in the degradation of textile fibres on exposure to light and methods of overcoming it are discussed. Polyacrylonitrile fibres such as Orlon are very resistant to degradation, whilst the reverse is the case with silk, nylon, and Perlon, and the latter fibres, particularly when delustred with TiO_2, should not be used for materials such as tent cloths which have to undergo very prolonged exposure. Iron compounds cause marked degradation, but this can be avoided by the use of phosphoric acid and its derivatives. Degradation of polyvinyl chloride fibres and films is caused by the liberation of free HCl, and can be prevented by the use of Pb and Sn salts such as dialkyltin dilaurate. Certain dyes, particularly yellows and browns, are known tenderers. The author has found that certain optical bleaching agents can exhibit a tendering action when present in relatively high concn. of 2–5%, but show no action in low concn. B. K.

Investigations into the Causes of Degradation of Textile Fibres by Micro-organisms — V. W. Wegener and R. Questel. *Melliand Textilber.*, **32**, 817–820 (Nov. 1951).

Drawings and photomicrographs of the different species of Aspergillaceæ and Penicilli which attack textile fibres are given. B. K.

Fibrillate Structure of Natural Cellulose. C. W. Hock. *J. Polymer Science*, **8**, 425–434 (April 1952).

The modern view that cellulose is divided into amorphous and crystalline regions does not adequately emphasise the fibrillate character of natural cellulose. As many reactions proceed more readily in the interfibrillar regions than in the fibrils themselves, it seems that the cellulose molecules in the fibrils are more highly ordered than those in the interfibrillar regions. Intensive treatments, e.g. acid hydrolysis, may cause further breakdown, whereby the fibrils are split transversely into small rod-shaped particles, but the comparatively greater ease with which fibrillation occurs following various degradative reactions suggests that the ordered character of the fibrils along the long axis is not interrupted by regions of the same magnitude and extent of disorder as those which occur between the fibrils. Although X-ray diffraction diagrams of cellulose have generally been considered to indicate the presence of small elongated regions of highly crystalline cellulose, i.e. micelles, it is equally consistent to suppose that the diffuse

diffraction patterns are caused by larger, essentially homogeneous regions, in which the arrangement of the molecules only approximates to crystalline regularity. These regions, which, except for occasional grosser irregularities, have a more or less uniform intermediate molecular order, may be identified with the fine electron-microscopically visible fibrils. From this viewpoint highly ordered micelles, unlike fibrils, are to be regarded more as incidental rather than as fundamental units of cellulose structure. C. O. C.

Electron-micrographs of Vegetable Fibres. K. Mühlethaler. *Biochim. Biophys. Acta*, **3**, 15–25 (1949): *Chem. Abs.*, **46**, 3755 (25 April 1952).

The cellulose of ramie, cotton, flax, sisal, and wood consists of completely individualised microfibrils 250–400 A. thick. In primary walls the microfibrils intertwine to form a network, while in secondary walls they are arranged more or less parallel to each other. Non-cellulosic substances (lignin, pectin, wax, hemicellulose) are embedded between the fibrils. 13 electron-micrographs (× 20,000) are given. C. O. C.

Morphology of the Cotton Fibre. III—Electron-microscopic Investigations on Fibre Cross-sections. W. Kling and H. Mahl. *Melliand Textilber.*, **33**, 328–331 (April 1952).

Techniques are described for the sectioning of cotton fibres and the production of impressions that can be examined with the electron microscope. Structural details of the fibre are revealed more distinctly on sections that have been etched with cuprammonium soln. or with enzymes. The results are completely in accord with previous observations (*see J.S.D.C.*, **68**, 224 (June 1952)) on the etched fibre surface, but it is observed also that fibril bundles, as well as being arranged in rope- or ribbon-like groups, may be arranged also in layers, which are not generally concentric with the lumen and are very irregular in form. A. E. S.

Distribution of the Carboxyl Groups in the Cell Wall of Spruce and Birch Holocellulose and Cotton. S. Asunmaa and P. W. Lange. *Svensk Papperstidning*, **55**, 217–223 (31 March 1952).

In the microspectrographic determination of the distribution of the carboxyl groups in the cell walls of spruce, birch, and cotton (*Gossypium herbaceum*), the light absorption of Crystal Violet introduced into the fibre wall was measured. In the woody cell wall the carboxyl groups showed an approximately linear distribution, the concentration being very low around the lumen. In the cell wall of cotton, the carboxyl groups are localised mainly in the primary wall, and in the remaining cell wall there are only very small amounts, if any, of carboxyl groups. The relation between the distribution of the carboxyl groups in the woody cell wall and that in the hemicellulose portion of the wood is briefly discussed. S. V. S.

Evaporation of Water from Cellulose. H. Bogaty, K. S. Campbell, and W. D. Appel. *Text. Research J.*, **22**, 75–81 (Feb. 1952).

Deterioration of cotton at the brown line which forms when water rises in cotton by capillary action is investigated. At this point oxycellulose of the mildly reducing acidic type is formed. A. B.

Effects of Tension on the Swelling of Cotton Fibres. R. Giuffria and V. W. Tripp. *Text. Research J.*, **22**, 21–25 (Jan. 1952).

Microscopic examination of the area of cross-section and the circularity of cotton fibres has shown that there is a greater increase in area after swelling in water under tension than without tension. The circularity is also increased under tension. These increases are not maintained on drying. Immersion in solutions of urea, ethylamine, or caustic soda also produces increases in area and circularity. A. B.

Oxidation of Cellulose by Ozone in Small Concentrations. H. Bogaty, K. S. Campbell, and W. D. Appel. *Text. Research J.*, **22**, 81–83 (Feb. 1952).

It is shown that ozone at concn. of < 0·06 p.p.m. can oxidise wet cellulose, although dry cotton is substantially unaffected. It is concluded that the contribution of atmospheric ozone to weather deterioration is relatively small. A. B.

Enzymic Degradation of Cellulose Fibres. R. Blum and W. H. Stahl. *Text. Research J.*, **22**, 178–192 (March 1952).

Fungal degradation and degradation by an enzyme solution give similar types of attack. An initial rapid loss of tensile properties is attributed to rapid degradation along spiral planes, and a further slow loss to continuing attack on the exposed surfaces, resulting in general erosion and localised notching. A. B.

Electron-microscopy of Degraded Cellulose Fibres. S. M. Mukherjee, J. Sikorski, and H. J. Woods. *J. Textile Inst.*, **43**, T 196–T 201 (April 1952).

Cellulose degraded by mechanical and chemical means (particularly parchmentising-strength H_2SO_4) is examined by electron microscope and X-ray techniques, and photographs are shown. There is apparent correlation between particle size and crystallinity as judged by X-ray photographs. Results for Fortisan indicate that the dispersion prior to spinning is not molecular but contains traces of the original micellar structure. J. W. B.

Opening of Flax by Water Treatment. M. Ludtke. *Melliand Textilber.*, **33**, 107–111 (Feb. 1952).

Flax and flax chaff in the green and the retted states are treated with steam at atmospheric pressure. The treatment is found to bring about the dissolution of ~ 25% of the green material and to be comparable in this respect with a double retting process. The extract formed is examined chemically for e.g. volatile and non-volatile acids, furfuraldehyde, and reducing power towards hypoiodite and cupric salts. The extracted matter is considered to be derived mainly from pectins and hemicelluloses, while the lignin present in the material is not greatly affected. A. E. S.

Action of Dilute Caustic Soda Solution on Jute Fibre. I—Hydrolysis of Ester Linkages. H. P. Bhattacharjee and H. J. Callow. *J. Textile Inst.*, **43**, T 53–T 59 (Feb. 1952).

The carboxyl content of jute treated with dil. NaOH followed by 0·1 N-HCl is determined, and the rate of carboxyl formation during short times of treatment with alkali indicates the reaction to be of the first order. This supports the view that an ester group is being saponified. Treatment of jute with 0·1 N-NaOH without washing leads to a high apparent acid content, and acetic acid is produced by acidification and steam distillation. It is suggested that it is formed by hydrolysis of acetyl groups within the fibre, a process which may explain the rapid loss of alkali which occurs in those industrial processes carried out in alkaline media. J. W. B.

Acetylation of Cellulose and Lignin in Jute Fibre. H. J. Callow. *J. Indian Chem. Soc.*, **28**, 605–610 (Nov. 1951).

Acetylated cellulose and acetylated lignin have been isolated from jute fibres which have been treated with acetic anhydride. The degree of acetylation indicated that lignin had reacted completely in a relatively short time, whereas cellulose had not been fully acetylated even after 48 hr. under the conditions used. The lignin after this period of time had a higher acetyl and a lower methoxyl content than that normally associated with lignin, suggesting that some demethylation had taken place. C. H. R.

Present Position of Hard and Soft Natural Fibres. W. H. Shearon. *Chem. Eng. News*, **30**, 1618–1621 (21 April 1952).

An account of the present production and development of abaca (Manilla hemp), the agaves (sisal, henequen, and cantala), palma ixtle, New Zealand flax, bowstring hemp (San seviera), and caroa among the hard fibres and jute, ramie, and kenaf among the soft fibres. Silk grass (fibres from the leaves of various plants of the pineapple family), on the basis of tests on samples from British Honduras, offers great promise and can be sold at prices comparable with sisal. In central Asia kandyr, a bast fibre similar to flax, is being cultivated on a large scale. *Urena lobata* is being grown in French North Africa as a substitute for jute, and *stockroo* has also received attention as a jute substitute. In the U.S.A. much work is being done on yucca fibre. C. O. C.

Morphology of Natural and Artificial Cellulose Fibres and their Nitrates. M. Staudinger. *Makromol. Chem.*, **7**, 70–81 (1951); *Chem. Abs.*, **46**, 2808 (25 March 1952).

Photographs show maintenance of fibrillar structure, appearance of crosswise breaks, and disappearance of spherical swelling on degradation of cellulose fibres and subsequent swelling. The phenomena are similar for nitrated fibres. Regenerated fibres, as well as nitrated regenerated fibres, show increased tendency to split lengthwise on swelling, with increased degradation. C. O. C.

Combined Lime in Rayon Pulps and its Behaviour in the Viscose Process. II Influence on the Filtration of Viscose. T. Kleinert. *Textil-Rund.*, **7**, 98–102 (March 1952).

Clogging up of the pores of filter cloths is traced to the presence of Ca salts of hemicellulose. In order to regenerate the filter cloths, cleaning with acetic acid should be followed by an aftertreatment with alkali. The results of the investigation justify the demand for cellulose pulp having a maximum lime content. G. L.

Radial Heterogeneity in Viscose and Cuprammonium Filaments. N. H. Chamberlain and M. P. Khera. *J. Textile Inst.*, **43**, T 123–T 157 (April 1952).

Viscose and cuprammonium filaments are "stripped", i.e. their outer layers are removed, by topochemical acetylation. Longitudinal and transverse swelling, rigidity, birefringence, regain, and tensile properties indicate that the two rayons differ markedly in the type and extent of the structural variation shown along a fibre radius. It is suggested that native cellulose contains lateral covalent cross-linkages between the main chain molecules, and that some of these survive in regenerated cellulose. A survey of the two coagulation processes shows that the retentions and distributions of such a structure are likely to be very different. During viscose coagulation lateral cross-links are broken on the outside but are largely present in the interior, which in consequence is relatively poorly oriented. Cuprammonium filaments, however, have—an outer layer of very low mol.wt. cellulose; next, a poorly oriented layer with intact lateral links; deeper still, a highly oriented zone with few, if any, cross-links; and finally, a poorly oriented highly cross-linked core. J. W. B.

Microscopic Investigation of the Milkiness of Viscose Rayon. I. Avisera. *Melliand Textilber.*, **33**, 331–335 (April 1952).

"Permanent" milkiness, a common defect in viscose rayon, has been considered to arise from the formation during the spinning process of small gas bubbles near the surface of the fibre. These bubbles are not readily observed with the ordinary microscope, but it is now shown that, for rayons of average milkiness, the layer of bubbles is readily visible under the phase-contrast microscope. For the examination of only slightly milky rayons, this method is not sufficiently sensitive, and it is shown that in these cases the bubbles may be made visible under the ordinary microscope by precipitating metallic silver in them. This is done by immersing the fibre for some hours in 5% silver nitrate soln., washing rapidly, and drying, the whole process being repeated twice again. The method permits the detection of incipient milkiness and aids in the control of production conditions. A. E. S.

Absorption of Electrolyte by Alginate Gels without and with Cation Exchange. I. L. Mongar and A. Wassermann. *J.C.S.*, 492–497 (Feb. 1952).

The preparations are given of fully swollen, cylindrical alginic acid and alginate gels, and various stoichiometric relationships characterising the interaction of these fibrous alginates with simple electrolytes are established. It is shown that these gels are cation-exchange materials, and equilibrium concentration coefficients pertaining to one particular exchange reaction are determined. H. H. H.

Intrinsic Viscosity of Sodium Alginate. M. L. R. Harkness and A. Wassermann. *J.C.S.*, 497–499 (Feb. 1952).

The viscosity of sodium alginate in solutions of simple electrolytes $Na^+_gX^g$ (X = Cl, F, OH, O·CO·CH_3, CO_3, SO_4, PO_4, and C_2O_4) has been determined in order to estimate the average distance $2R_g$ between the ends of the alginate chains. In 0·1 N. electrolyte solutions the R_g values are not markedly influenced by the nature of X, but in more concentrated solutions a significant anion effect obtains. In these solutions the alginate chains are not fully extended. One possible explanation involves the assumption that in 1 N. solutions of $Na^+_gX^g$ the dielectric constant of the reaction mixtures is so strongly modified by the nature of X as to bring about an alteration in the concentration of pairs between sodium and alginate ions to an extent sufficient to give rise to the viscosity changes actually observed. H. H. H.

Influence of Ion Exchange on Optical Properties, Shape, and Elasticity of Fully Swollen Alginate Fibres. J. L. Mongar and A. Wassermann. *J.C.S.*, 509–510 (Feb. 1952).

Treatment of fully swollen, stretched, optically anisotropic calcium alginate fibres with solutions containing sodium ions gives rise to a cation-exchange reaction, accompanied by an increase of volume and transparency of the gel, by a loss of birefringence, by axial contraction, and by increase of elasticity. In an investigation of the mechanism of elastic deformation of sodium alginate threads, it is found that shortening of stretched test pieces involves an increase of entropy. That type of cation exchange is established which is conducive to axial contraction and simultaneous radial swelling of various alginate fibres. The observations are explained from the viewpoint of changes of shape of chain-like alginate molecules through ionic metatheses. H. H. H.

Heat Effects accompanying the Absorption of Simple Electrolytes by Fully Swollen Alginate and Cellulose Gels. A New Microcalorimetric Method. I. L. Mongar and A. Wassermann. *J.C.S.*, 510–513 (Feb. 1952).

A microcalorimetric method is described for the determination of small heat changes which accompany the reversible interaction of fully swollen alginate and cellulose gels with solutions of calcium and sodium chloride. The calorimetric technique is a modification of that used previously by Hill (cf. *Proc. Roy. Soc.*, **B 126**, 136 (1938)). The reactions investigated represent typical examples showing the kind of energetic conditions conducive either to salting out or to salting in of colloids as brought about by addition of simple electrolytes. The results allow a comparison between the heats of swelling of gels in water and in electrolyte solutions. H. H. H.

Visibility of the "Cuticula" of Wool under the Phase-contrast Microscope. L. Algera. *Text. Research J.*, **22**, 97–98 (Feb. 1952).

It is shown that the thin membrane of about 100 A. thickness covering the surface of animal hair is observable under the phase-contrast microscope. A. B.

Plasticity of Wool. F. W. Dry, R. W. Burley, and J. B. Speakman. *Nature*, **169**, 371–372 (1 March 1952).

Fibres, protected from the age of two months with a canvas cover, are taken from the backs of New Zealand Romney and Lincoln lambs after 12 and 6 months' growth respectively. They are classified according to the shape of their tip ends, and the value of the reaction constant for the rate of creep is determined. In general, there is an inverse relationship between the plasticity of the fibres and the order of appearance of the follicles from which they are derived. J. W. B.

Flexural Fatigue and Visco-elastic Properties of Wool Fibres. B. Lincoln. *J. Textile Inst.*, **43**, T 158–T 172 (April 1952).

Untreated and carbonised wool fibres are examined in a flexometer, and the numbers broken are determined over a range of flexing cycles up to 10,000. Carbonised fibres have an appreciably lower resistance to flexural fatigue, but on neutralisation recover much of their original resistance. Fibre diameter at the point of break influences the results, the finest fibres having increased resistance owing to the less severe bending strain at the point of flexure, and the coarsest giving anomalous results because the interiors of the fibres remain coherent when the outer skins have broken. Damping capacities are measured by the transverse vibration method (60 cycles/sec.), and show that normal, carbonised, and neutralised fibres have similar response curves when dry, but that at 10% regain the carbonised fibre has a much higher damping capacity. Similar results are obtained when damped transverse vibrations at flexometer rate (1·6 cycles/sec.) are measured on a rocking-beam oscillator. J. W. B.

Physiologico-chemical Properties of Wool. O. Mechels. *Melliand Textilber.*, **33**, 275–280 (April 1952).

The physical and chemical characteristics that determine the physiological properties of clothing constructed from various fibres are discussed. The heat retention by various fabrics is determined by subjecting a vessel, wrapped with the fabric and containing water at blood heat, to a standard blast of cold (– 10°c.) air. Admixture of staple viscose rayon is found to have a markedly deleterious effect on the thermal properties of wool material. Thus, an all-wool blanket and a 50 : 50 wool–rayon blanket of the same weight and thickness, conditioned at 65% R.H., have heat-permeabilities in the wind test of 0·85 and 0·98 (g.cal./sq.dm./min./°c.) respectively, in spite of the fact that the air-permeability of the wool material is 19% greater than that of the mixture. When the test is applied to the same fabrics after conditioning at 100% R.H.— corresponding roughly to the effect occurring when a perspiring person goes into a cold atmosphere— the difference is increased further, the heat-permeability figures being now 0·90 and 1·31 respectively. Measurements are made also of "sweat" (mixed vapours of water and acetic acid) permeability in a specially constructed apparatus. It is pointed out that wool has the valuable property of binding chemically the acids and other components of sweat. Wool does not retain harmful micro-organisms so readily as cotton— it is shown that, after impregnating with bacteria, wool may be largely freed from infection by simple vigorous shaking, whereas cotton material, similarly treated, retains the infection. A. E. S.

Combination of Wool with Acids. W. Harrison. *J.S.D.C.*, **68**, 176–178 (May 1952).

Sedimentation and Diffusion of Soluble Fibroin. F. H. Holmes and D. I. Smith. *Nature*, **169**, 193 (2 Feb. 1952).

Aqueous solutions of fibroin are prepared by dissolving degummed silk in cuprietylenediamine, neutralising, dialysing against distilled water, precipitating part of the fibroin by HCl, neutralising the rest, and again dialysing. Sedimentation measurements are made in the ultracentrifuge and diffusion measurements in a Neurath diffusion cell. It is found that the sedimentation constant probably does not vary much with the concn. in any one preparation of fibroin, while the symmetry of the diffusion curve suggests that Fick's law is valid. An average mol. wt. of 84,000 is found, a value greatly in excess of the 33,000 reported by Coleman and Howitt. The wide variation obtained between different preparations suggests the need for closer control during the various steps. A frictional ratio of 3 indicates that the fibroin molecule is not a compact unhydrated sphere. J. W. B.

Groundnut-protein Fibre — Ardil. P. A. Koch. *Textil-Rund.*, **7**, 118–121 (March 1952).

A collection of data and references concerning Ardil. Historical development, sources of raw material, production methods, chemical composition, physical properties, applications, and relevant patents are covered. G. L.

Synthetic Fibres in Prospect and Retrospect. R. Hill. *J.S.D.C.*, **68**, 158–168 (May 1952).

Chemical Constitution and Physical Properties of Synthetic Fibres. K. R. Goldstein. *Melliand Textilber.*, **32**, 900–906 (Dec. 1951).

Synthetic fibres can be classified according to their chemical constitution into two main groupings—(1) Polymeric hydrocarbons and their derivatives, e.g. polystyrene, polyvinyl chloride, and polyacrylonitrile. (2) Mesomeric-chain polymers, in which mesomeric, e.g. amide, groups form part of the main chain, e.g. polyamides, polyurethans, and polyesters. Subdivision then takes place according to the type and magnitude of the intramolecular forces and the symmetry of the macromolecules. Symmetry increases from polystyrene to polyethylene and from polyvinyl chloride to polyvinylidene chloride. A high degree of symmetry tends to result in crystallisation. B. K.

X-51 Acrylic Fibre — Physical and Chemical Properties. A. Cresswell. *Amer. Dyestuff Rep.*, **41**, 161–162 (17 March 1952).

X-51 acrylic fibre is near-white, semi-dull, and of circular cross-section, with a sticking temp. of about 280°c., though it shrivels below this temp. Dry and wet tenacities of the continuous filament are 3·6 and 3·2 g./denier respectively, with elongations of 22%; the staple has slightly lower strength, but similar good resistance to deformation. Crimped staple withstands boiling water, exposure resistance is high, and the fibre is non-inflammable. The fibre has excellent chemical resistance and is unaffected by micro-organisms. J. W. B.

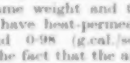
Structure of Asbestos Fibres. L. Holzapfel. *Naturwissenschaften*, **38**, 406 (1951): *Chem. Abs.*, **46**, 3365 (25 April 1952).

The spiral structure of the fibres is demonstrated from a number of electron micrographs. C. O. C.

PATENTS

Linear Copolymers of the Polyamide Type. Organico. *BP* 670,721

The *N*-carboxyanhydrides of α-amino acids having the formula—



(R = H, Alk, Ar, or aralkyl) copolymerise with amino acids having ≥ 4 C in a straight chain between the amino group and the carboxyl group to yield products which can be drawn into fibres, some of which, e.g. that from 11-aminoundecanoic acid and glycine, are stronger than nylon. They can also be used in the plastic arts. C. O. C.

Producing and Conditioning Thermoplastic Filaments. Firestone Tire & Rubber Co. *BP* 670,951

Plastic filaments of resinous, crystalline, and orientable material are delivered in deformable condition, e.g. after extrusion, to a first point at a constant volume rate but subject to variations in linear rate. The filament is then driven to a second point at a controlled linear rate sufficiently in excess of the first linear rate to stretch the filament to a predetermined orientation. Changes in stiffness during drawing automatically induce changes in the linear speeds, thus ensuring that the final thread is of uniform cross-section despite the initially varying physical properties. J. W. B.

X-51 Acrylic Fibre — Scouring, Dyeing, and Finishing (VIII p. 281).
Pore Size of Keratin (XII p. 285).
Stabilising Vinyl and Vinylidene Chloride Polymers to Light and/or Heat (XIII p. 286).

VII— DESIZING; SCOURING; CARBONISING; BLEACHING

Rôle of Amino Acids in the Degumming of Silk. V. N. Krestinskaya and M. B. Aymukhamedova. *J. Appl. Chem. U.S.S.R.*, **24**, 1298–1305 (Dec. 1951).

The degumming of silk by means of solutions containing hydrolysis products of sericin (see *J.S.D.C.*, **67**, 475 (Nov. 1951)) is examined further. On dialysing the degumming soln., much of the active agent passes into the extract, but it is shown that the activity is not to be attributed to amino acids, which may be almost completely absent in highly active liquors, but probably to polypeptides. Analyses and activity determinations on solutions that have been aged or concentrated confirm these conclusions. A. E. S.

Detergent Properties of Mixtures of Soap and Phosphates. H. Stupel. *Textil-Praxis*, **7**, 231–234 (March 1952).

Laboratory washing tests were carried out using mechanically driven plungers operating in ordinary dye beakers. Cotton cloth was artificially soiled using a standard mixture and treated along with the detergent in 200 ml. cold hard water (12° German hardness), brought to 85°c. in 20 min., maintained at this temp. for 15 min., rinsed once warm and twice cold, air-dried, and ironed. The test pieces were examined photoelectrically, and the results obtained from the following equation—

$$A\,WG = WG_t - WG_u$$

($A\,WG$ = degree of scouring; WG_u = whiteness of the soiled textile material; and WG_t = whiteness of scoured

material). Experiments with 1 and 2 g. of soap with 0·5–6·0 g. of various complex phosphates have given the following results—Tetrasodium pyrophosphate shows the best detergent action, followed by tetrapolyphosphate, tripolyphosphate, and hexametaphosphate. Hexametaphosphate is the best product as regards dispersion of lime soaps, and is followed by tetrapolyphosphate, tripolyphosphate, and pyrophosphate. Potassium metaphosphate exhibits outstanding properties, but on account of solubility and cost is used only together with pyrophosphate. The best results were obtained with a mixture of 1 g. soap, 1 g. pyrophosphate, and 1·5 g. potassium metaphosphate per litre. Excess phosphate results in decreased detergency. B. K.

Distribution of Detergent Molecules on the Fibre Surface. H. Stüpel. *Melliand Textilber.*, **32**, 941–942 (Dec. 1951); **33**, 166 (Feb. 1952).

In detergency the surface which is capable of being covered and which is actually covered by colloidal electrolytes is of importance. W. Kling has calculated this surface and called it the "external surface", the whole surface of the fibres being called the "internal surface". Practical laundry trials with white cotton show that the values for the "active surface", assuming a unimolecular covering, are of the order of 10^4–10^5 sq. cm./g. cotton, between the internal and external surfaces. B. K.

Microscopic Study of Oiled Textile Fibres immersed in Aqueous Media. II Secondary Droplets. D. G. Stevenson. *J. Textile Inst.*, **43**, T 112–T 118 (March 1952).

Properties of secondary water droplets occurring on oiled salt free fibres immersed in salt solutions are described and illustrated. It is suggested that, as the less hydrated ions, e.g. iodide and thiocyanate, diffuse into the fibre which is already swollen according to the solution R.H., further water is adsorbed by the wool and can thus no longer dilute the solution inside the fibre. The increased concn. causes osmosis, leading to an increased pressure inside; this is relieved by ejection of soln. into the oil drops. J. W. B.

Wetting of Greige Cotton. R. E. Wolfrom and A. C. Nunesde. *Text. Research J.*, **22**, 246–253 (April 1952).

In a study of the effect of temperature on Draves wetting time, it is shown that most wetting agents give decreased wetting times up to 60° C., increasing to a peak at 85° C., followed by a sharp drop. A study of wet pickup in the presence of wetting agents is also made. A. B.

Laundering Experiments on Artificially Soiled Nylon. A. von Segesser and H. Stüpel. *Textil-Rund.*, **7**, 93–98 (March 1952).

Nylon is not as easily soiled as cotton, and it is more readily cleaned. Protective colloid action of the detergent is far less important for the laundering of nylon than for cellulosic fibres. Washing soda is a very effective alkaline detergent; at low concentrations it is more active than amonic organic reagents. G. L.

Cellulose Bleaching by Chlorite. J. Meybeck, P. Albahert, J. Chabert, and A. Banderet. *Bull. Inst. text. France*, No. 26, 23–64 (June 1951); *J. Textile Inst.*, **43**, A 240 (April 1952).

The bleaching of cotton fabrics with mixtures of chlorite and hypochlorite has been investigated, and the effect of such factors as concentration of the reagents, pH, temperature, and the reaction period on the bleach obtained has been studied. Bleaching with a chlorite-hypochlorite mixture does not appear to have any advantage over bleaching with hypochlorite alone. The mechanism of the chlorite-hypochlorite reaction has been studied. There are 37 references. C. J. W. H.

Influence of Bleaching Natural Furskins on the Properties of the Hair and Leather. F. Stather and G. Konigfeld. *Ges. Abh. deutsch. Lederinst.*, No. 7, 5 (1951); *J. Soc. Leather Trades Chem.*, **36**, 26 (Jan. 1952).

The optimum conditions are given for bleaching with hydrogen peroxide; sodium bisulphite and potassium permanganate do not bleach sufficiently. Initial treatment with soda and formaldehyde is recommended. Mordanting with a ferrous salt causes least deterioration of the hair and leather. C. J. W. H.

Ogden Process for Simultaneously Stripping and Dyeing Wool (VIII below).

X-51 Acrylic Fibre—Scouring, Dyeing, and Finishing (VIII p. 281).

Wetting of Textiles in Theory and Practice (X p. 282).

VIII—DYEING

Fastness of Azoic Dyeings on Cotton to Hydrogen Peroxide Bleaching. ICI *Technical Circular.*

See under "Manufacturers' Publications" (p. 263).

Resistance of Dyed Bathing Costume Fabrics to Chlorinated Water. ICI *Technical Circular.*

See under "Manufacturers' Publications" (p. 263).

Vat Dyeing—The Standfast Molten Metal Process. R. W. Speke. ICI *Technical Circular*; *Färgeriteknik*, **7**, 147 (1951).

Laboratory evaluation of the molten metal process indicates *inter alia* that affinity effects are largely eliminated, and that good uniformity of colouring can be obtained on mixed cellulosic fibres. C. J. W. H.

Continuous Dyeing of Vat Dyes (the Standfast Molten Metal Technique). J. Ardron, M. R. Fox, and R. W. Speke. J.S.D.C., **68**, 249–256 (July 1952).

Method of Determining the Concentration Dependence of the Diffusion Coefficient. H. Fujita and A. Kishimoto. *Text. Research J.*, **22**, 94–95 (Feb. 1952).

A mathematical determination of the dependence of the diffusion coefficient upon the concentration of diffusing material is presented. A. B.

Numerical Solution of the Differential Equation for Adsorption-controlled Diffusion in a Solid. H. Fujita. *Text. Research J.*, **22**, 281–286 (April 1952).

An attempt is made to evaluate a numerical solution of the differential equation for adsorption-controlled diffusion in a solid without making any particular assumptions. A. B.

Affinity of Vat Dyes for Cotton. J. A. Fowler, A. G. H. Michie, and T. Vickerstaff. *ICI Technical Circular.*

Translation of a paper originally published in German (abstracted in J.S.D.C., **67**, 353 (Sept. 1951). C. J. W. H.

Fastness of Cotton Dyeings. M. R. Fox. *Dyer*, **107**, 489–493 (4 April 1952).

Report of a lecture in which factors are discussed affecting dye fastness. Examples are given showing how certain chemical groups in dye molecules are modified to produce dyes much faster to light, washing, acids, and alkalis; e.g. hydroxyl groups confer alkali sensitivity on some dyes, and are therefore "blocked" by ethylation or methylation. Several insoluble azo dyes are affected by soda boiling owing to reduction of NO_2 groups to NH_2, and these combinations must be avoided where possible. "Greening" of Indanthren Blues by overoxidation is mentioned and the necessity for careful development stressed. pH of finished cotton material is shown to affect light fastness of some dyes, and goods should be neutral after finishing. Some direct dyes exert catalytic fading action on others, and therefore should not be used in mixtures. A. H.

Ogden Process for Simultaneously Stripping and Dyeing Wool. F. A. Prisley. *Amer. Dyestuff Rep.*, **41**, P 251–P 252 (14 April 1952).

Fabrics normally requiring a separate stripping process are dyed in a bath made up in the order—dye, acid, stripping agent (formaldehyde-sulphoxylate type). The bath is raised to the boil in 1 hr., boiled for 30 min., 10% Na_2SO_4 (anhydrous) then being added, and boiled for a further 45 min. Dyeing proceeds at the same time as the original colours are stripped. Selected dyes must be used, but they are not listed. J. W. B.

New Method for the Dyeing of Mineral Khaki. E. H. Daruwalla and G. M. Nabar. J.S.D.C., **68**, 168–170 (May 1952).

Dyeing of New Fibres. G. S. J. White. *Textil-Rund.*, **7**, 12–23 (Jan.) and 139 (March 1952).

A survey of modern developments in the dyeing of Ardil, Orlon, nylon, and Terylene. The respective advantages and limitations of the methods described are critically discussed. Fibre mixtures and the influence of filament

fineness are carefully considered, whilst fundamental principles forming the basis of experimental techniques are concisely explained. G. L.

Continuous Dyeing of New Synthetic Fibres. A.A.T.C.C. Rhode Island Section. *Amer. Dyestuff Rep.*, **41**, P 223–P 241 (14 April 1952).

A comprehensive investigation of possible methods for continuously dyeing fabrics of Terylene, Orlon, Acrilan, and dynel, both from the aspect of converting existing batch processes and from that of developing new processes, is presented. Emphasis is laid on application of vat dyes and their leuco esters because of their superior light and wash fastness. No continuous process is, however, developed for acetate, acid, or premetallised dyes on the four fibres, and for vat dyes and leuco esters on acrylic fibres, but a technique is found whereby cuprous ions can be continuously applied to acrylic fibres. This comprises padding at 70° F. in a bath containing 10% cupric sulphate, 2% Sulphoxite C, 2% hydrosulphite, and 1% Duponol ME, air-drying, oven-drying at 160° F., and steaming for 12 sec. Such fabric can then be batch-dyed with leuco esters in addition to acid dyes. Inadequate dye penetration is shown up by a surface-stripping test in which the fabric is treated for 5–10 min. in 1% NaOH and 1·5% $Na_2S_2O_4$ at 120° F. Only well penetrated dye remains, and application of this treatment to adequately dyed fabrics greatly improves their rubbing fastness. J. W. B.

Continuous Presetting and Dyeing of Tricot Fabric. L. L. Walmsley. *Textile World*, **102** (4), 112, 113, 288, 292 (April 1952).

A system of continuous presetting, dyeing, and extracting tricot fabric in open width is being developed by the American Viscose Corpn. Diagrams and data are given comparing the process with the older batch process, where dyeing is done in rope form. Better strength, shrinkage, and yield are obtained. C. O. C.

Dyeing of Hydrophobic Fibres. P. Joly. *Teintex*, **17**, 139–155 (March 1952).

Dyeing of nylon with logwood black. Dyeing of acetate rayon and Thermovyl. Production of solid shades on, and reservation of nylon in, nylon–wool unions. B. K.

Theoretical and Practical Considerations in the Dyeing of Vinyl Polymer Fibres. A.-M. Baron. *Teintex*, **17**, 33–55 (Jan. 1952).

Physical and chemical properties of Thermovyl, Rhovyl, and Fibravyl are discussed with special reference to shrinkage on heat-treatment. Dyeing can be carried out in the mass, or the fibre is dyed with disperse acetate rayon dyes using swelling agents where necessary to obtain fuller shades. Blacks are obtained with azoic dyes. Details are given of the dyeing of Thermovyl in unions with wool, cotton, nylon, and viscose and acetate rayons. B. K.

X-51 Acrylic Fibre — Scouring, Dyeing, and Finishing. A. L. Peiker. *Amer. Dyestuff Rep.*, **41**, 162–165, 179 (17 March 1952).

X-51 acrylic staple fibre may be given a wool-scouring procedure, but temp. > 140° F. and time > 30 min. at 120° F. should be avoided. If yellowing does occur, an acid rinse restores the whiteness. Synthetic wetting agents and detergents in an acid bath at the boil may also be used, and are recommended for the continuous filament. Acid, direct, acetate, basic, and vat dyes are all used for the staple, while acetate dyes show most promise for the filament. J. W. B.

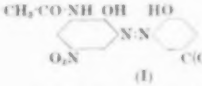
PATENTS

Solubilisation of Sparingly Soluble Metal-complex Direct Cotton Dyes with Ammonia or Amines. Ciba. *BP* 670,522

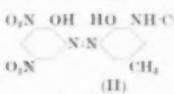
Sparingly soluble metal (especially Cu) complexes of dyes containing one or two *oo'*-dihydroxyazo or *o*-carboxy-*o'*-hydroxyazo groups may be rendered more soluble (and hence suitable for direct dyeing) by treatment with ammonia or water-soluble amines. Chemical combination between the metal complex and the ammonia or amine appears to occur, but the compounds are unstable towards acid. Hence the process, whilst applicable to the dyeing of cellulose under neutral or alkaline conditions, does not lend itself to the dyeing of animal fibres. Thus, all parts being by weight, the copper complex (1) of the dye dianisidine→(1-naphthol-3-sulphonic acid)$_2$ is boiled with condenser water (200) (i.e. distilled water derived from power steam) and 24% ammonia (2). A clear blue solution is obtained, from which the dye separates on cooling in the form of a crystalline complex. The stock solution so obtained is diluted with water (to 3000), and Na_2CO_3 (2) added to form a dyebath into which cotton (100) is added at ca. 70° C. The temperature is raised to the boiling point and maintained at the boil for 45–60 min., Glauber's salt (30) being added, to complete the reddish blue dyeing. E. S.

Dyeing Wool with *oo'*-Dihydroxymonoazo Compounds of Low Solubility. Ciba. *BP* 671,243

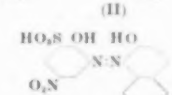
oo'-Dihydroxymonoazo compounds free from carboxy or sulpho groups, which are applicable to wool from a neutral or weakly alkaline bath (e.g. by the metachrome process), may not be applicable from an acid bath if their solubility is too low under acid conditions. However, if they are mixed with *oo'*-dihydroxymonoazo dyes which are applicable from an acid bath, satisfactory dyeings are obtained. Thus a mixture of the dye (1) of low solubility (50 parts) with the dyes II (35) and III (15) (all as Na salts) gives a level brown on loose wool machine-dyed from an acetic acid bath, sulphuric acid being added towards the end of the dyeing operation, and the dyeing being finally afterchromed.



(I)



(II)



(III) E. S.

High-temperature Dyeing with Vat Dyes susceptible to Over-reduction. American Cyanamid Co. *USP* 2,576,846

Addition to the vat of a compound containing nitrogen attached by at least one covalency to oxygen and at least one covalency to an element other than O or N, e.g. *N*-(2-nitro-2-methylpropyl)sulphamidic acid, obviates the deleterious effects of high-temperature dyeing with vat dyes sensitive to high-temperature vats.

USP 2,576,847

This method is particularly applicable to pyranthrone (*C.I.* 1096) and dibromopyranthrone, the amount of nitrogenous compound used being not < 25% of that of the dye. C. O. C.

Alkanesulphonic Acids as Assistants in Dyeing with Premetallised Acid Dyes. Standard Oil Co. *USP* 2,572,954

Alkanesulphonic acids of 1–4 C are more effective assistants than sulphuric acid in dyeing with premetallised acid dyes, and cause much less degradation of the wool. C. O. C.

Dyeing Vinyl Resin Fibres. Union Carbide & Carbon Corpn. *USP* 2,577,846

Vinyl resin fibres, especially those made from vinyl halide–vinyl aliphatic ester copolymers and after-chlorinated polymers of that type, are treated at not > 60° C. with the dye dissolved in a volatile liquid non-solvent for the fibres. This coats the fibres with the dye, and either immediately or after storing, e.g. yarn may be wound on bobbins, they are treated at not < 105° C. under sufficient tension to prevent shrinkage. Excellent fixation of acetate, basic, and oil-soluble dyes is obtained. C. O. C.

Dyeing Tanned Fur-skins. S. *BP* 670,546

Chrome-tanned sheepskins or furs whose flesh sides have been finely fluffed are treated with an aqueous solution of a surface-active organic compound, e.g. lauryl alcohol sulphonate, and then dyed in presence of such substance with dyes, particularly direct cotton dyes, which dye the

leather but not the hair, dyeing being done preferably at 40–50° C. C. O. C.

Coloured Glass Fibres. Owens-Corning Fiberglas Corpn. *USP* 2,577,936

Glass fibres in individual or fabric form may be permanently coloured by thermal treatment with the vapour of a metal salt which yields coloured oxides; e.g. by treating at > 600° F. for between a few sec. and 5 min., depending on the temperature, with the vapours of an Sb, As, Ba, Be, Bi, Cu, Pb, Hg, Sn, Ti, or Zn salt of an aliphatic acid, treating the coloured fibres with a polysiloxane, and then heating at 600–800° F. to set the polysiloxane. C. O. C.

Relation between Structure and Properties of Azo Dyes (IV p. 269).
Dyeing and Printing Textiles with Pigmented Emulsions (IX below).
Use of Metallic Baths in Textile Processing (X this page).
Dressing and Dyeing Fur Skins (XII p. 285).

IX—PRINTING

Photomechanical Manufacture of Screens. P. Welcker. *Teintex*, **17**, 101–109 (Feb. 1952).

Detailed description of the production of screens, including a comparison of the properties of silk, phosphor-bronze, and nylon, the gelatin and lacquers used, and the mechanical construction and treatment of the actual screen. B. K.

PATENTS

Improving the Printing Properties of Ester Salts of Leuco Vat Dyes. General Aniline. *BP* 670,354

Incorporation of a basic pyrazolone, e.g. 2:3-dimethyl-4-phenyl-5-pyrazolone, improves the solubility of the solubilised vat dye and the stability of printing pastes made from it, and results in prints of better colour value and brilliancy. C. O. C.

Dyeing and Printing Textiles with Pigmented Emulsions. IC. *BP* 669,739

Better colour value and fastness to rubbing are obtained by using a water-in-lacquer emulsion, the lacquer phase of which comprises a pigmented dispersion of a solid polyethylene in a solution of a thermosetting resin in a volatile organic solvent, the polyethylene : pigment ratio being 0·1–100 : 1 by weight. C. O. C.

Transfer Printing on to Textile Fabric. C. A. Colombo. *BP* 670,174

One side of a sheet of paper is coated with a water-insoluble glue. The film of glue is then coated with a grease, and the desired picture or design is printed in colours on to the treated side of the paper. This printed paper is then applied to a wet fabric and subjected to heat and pressure so as to transfer the picture to the fabric. C. O. C.

Colour Photography. Kodak. *BP* 670,457

The light-sensitive layer used consists of a water-soluble, water-permeable colloid binder in which are dispersed particles of *p*-phenylpropyl alcohol, a silver halide peptised with a water-insoluble material, and a colour coupler. C. O. C.

Printing Colour Positives from Colour Negatives. General Aniline. *BP* 670,504

Method and mechanism for obtaining prints having correct colour balance. C. O. C.

Imbibition Printing. Technicolor Motion Picture Corpn. *USP* 2,577,332

Photographic Colour Correction Process. Eastman Kodak Co. *USP* 2,578,333

Subtractive Method of Colour Photography. Tele-Industrie. *BP* 671,121

Use of Metallic Baths in Textile Processing (X this page).

X—SIZING AND FINISHING

Sizing of Spun Nylon Yarns with Various Agents. J. H. Langston. *Text. Research J.*, **22**, 111–116 (Feb. 1952).

Of the several potential sizing agents evaluated on spun nylon, the most promising appear to be those used for filament nylon, i.e. polyvinyl alcohol, polymethacrylic acid, and polyacrylic acid. Their efficiency is increased by the addition of 1–3% of sodium alginate. A. B.

Principles of Textile Finishing. E. I. Valko. *Text. Research J.*, **22**, 213–222 (March 1952).

The relation between the theory and the technique of textile finishing is discussed in terms of polymer and colloid science, and illustrated by the dyeing of indigo. Spatial and energetic factors are discussed in relation to some finishing processes. A. B.

Use of Metallic Baths in Textile Processing. F. Neustelberger. *Melliand Textilber.*, **32**, 955–958 (Dec. 1951).

Experiments described include the padding of molten aluminium on to tent cloth, fixation of prints without intermediate drying, dyeing of vat and direct dyes, baking of pigment prints and synthetic resin finishes, and singeing and drying of fabrics. B. K.

Wetting of Textiles in Theory and Practice. K. J. Nieuwenhuis. *Ingenieur* (Utrecht), **9**, MK 26–30 (1949); *Chem. Abs.*, **46**, 3286 (10 April 1952).

A survey of the theory of wetting of textiles and of experiments done at the Delft Experimental Station for Laundering. A low value of interfacial tension and a high rate of diffusion of the surface(or interfacial)-active agent are essential for a high rate of wetting. This explains the differences in wetting by such compounds as Na dialkyl sulphosuccinates, alkyl sulphates, and fatty acid soaps, and the effects of adding inorganic salts, variation of pH with soap solutions, differences between fatty acid soaps, and effects of changes of temperature. Conclusions reached for wetting of yarns are not necessarily valid for fabrics owing to differences in the shapes of the capillary voids. C. O. C.

Influence of Cross-sectional Shape of Raw Cotton on Dimensional Changes in Mercerisation without Tension. R. S. Orr, G. C. Humphreys, and J. N. Grant. *Text. Research J.*, **22**, 89–93 (Feb. 1952).

It is shown that the % increase in area and % decrease in perimeter caused by loose mercerisation depend upon the cross-sectional shape of the original fibres, flat fibres shrinking more in perimeter than round fibres. A. B.

Variables in Improving Crease Recovery of Cotton Fabrics with Synthetic Resins. A.A.T.C.C. Philadelphia Section. *Amer. Dyestuff Rep.*, **41**, P 196–P 212 (31 March 1952).

Crease recovery and tear tests are carried out on cotton fabrics of different constructions which have been subjected to resin impregnation and curing, to the application of preformed polymers, and to stiffening and softening agents. Fabric construction is in general most important; i.e. fabrics strongest prior to treatment are usually the strongest after, though strength values vary according to testing methods. Softening efficacy varies greatly with fabric construction. Surface resins do not impart crease recovery; fibre reactants (formaldehyde and modified urea–formaldehyde) and resin formers do, the former being more efficient on a concentration basis. Premercerisation has only slight effect. Crease recovery is improved at the expense of tear strength, though the relation between the two varies with different resins and procedures. Two tear tests are used and their significance is discussed. J. W. B.

Effect of Sodium Bicarbonate on the Combustion of Cellulosic Materials. J. E. Dolan. *Chem. and Ind.*, 368–371 (26 April 1952).

A simple apparatus is described in which cellulose is strongly heated *in vacuo* and the temperature, products, and pressure of pyrolysis are observed. NaOH, KOH, and $NaHCO_3$ when mixed with cellulose cause an increase of 20–30% in charred residue and a decrease of 30% in tarry products. The maximum effect is obtained with about 7% by wt. of added chemical, impregnation with $NaHCO_3$ soln. being more effective than addition of powder. It is suggested that hydrolysis of the impregnated bicarbonate gives NaOH, which degrades the cellulose, causing pre-flame molecular disruption, a change in tar : char ratio, and a reduction in tarry distillate, thus removing the source of exothermic reaction. Powdered carbonate and bicarbonate have essentially the same reaction mechanism, the difference in effect being one of degree. J. W. B.

Heat Resistance of Partly Acetylated Cotton Fabrics. E. Honold, J. M. Poynot, and A. F. Cuculla. *Text. Research J.*, **22**, 25–29 (Jan.) and 222 (March 1952).

Heat-treatment of cotton, unacetylated and acetylated to contain 17·4, 23·4, and 28·7% acetyl, at 160°C. (320°F.), in nitrogen, air, water vapour, and water vapour and air, has shown that partly acetylated fabrics are more heat-resistant than the corresponding unacetylated fabric. A. B.

Copper as a Textile Fibre Preservative. H. L. von Goehde. *Amer. Dyestuff Rep.*, **41**, 164, 179 (17 March 1952).

Uses of copper compounds in rotproofing are surveyed briefly. J. W. B.

Detoxifying Mechanisms in Clothes Moth Larvæ. D. F. Waterhouse. *Nature*, **169**, 350 (29 March 1952).

Clothes moth larvæ are able to develop on wool fabric impregnated with many of the inorganic poisons which are highly toxic to insects and other animals. Alkaline, strongly reducing, digestive juices reduce the disulphide bonds in wool to thiol groups and H_2S; if any metal ions are present capable of forming insoluble sulphides, they are so converted. Larvæ fed on metal-impregnated silk produce no sulphides unless a sulphur-containing material is added to the diet; and if the diet does contain cystine, less is excreted if a metal is also present. J. W. B.

PATENTS

Crimping Wool and other Naturally Resilient Fibres. Alexander Smith. *USP* 2,575,781

Slubbing is softened and heated, then crimped by any suitable device, and finally treated with a setting agent in a chamber at controlled pH, temperature, and moisture content.

USP 2,575,833

The pretreated fibres are fed between feed rolls into a crimping chamber which is kept full of fibres under a predetermined back pressure. As the fibres are forced into this chamber they are laid in zig-zags and pressed to form sharp angular bends with intervening straight portions. They are then set with superheated water in another chamber.

USP 2,575,837

The crimped fibres are set with steam, thioglycollic acid, a thioglycollate, formaldehyde, or a formaldehyde-sulphoxylate.

USP 2,575,838

Fibres having better carding and spinning properties are produced if after crimping and setting they are treated in a relaxing bath, which is preferably a dyebath, before being dried. C. O. C.

Crimping Uncrosslinked Fibres. Alexander Smith. *USP* 2,575,839

Vegetable or uncrosslinked synthetic fibres are mechanically crimped by the process described in *USP* 2,575,833 (above), the temperature in the crimping chamber being above that at which the natural resilience of the fibres resists deformation, and are then passed into another chamber, where they are rapidly cooled. C. O. C.

Stabilising Cellulose Yarns to Heat. DuP. *USP* 2,577,593

The resistance of cellulose to degradation by heat is improved by impregnation with not < 0·1% by weight of 1-phenylguanide. C. O. C.

Treating High-twist Synthetic Polymeric Fibres and Yarns. Zavody pro Chemickou Vyrobu N.P. and Elite, Sdruzene Tovarny Punco-ch N.P. *BP* 670,994

Fibres and threads made from synthetic high-mol.wt. linear polymers and polycondensates, particularly those twisted > 900 turns/m., are wound on perforated sheet metal cops, where they are impregnated, twist-fixed, dyed, delustred, stiffened, softened, etc. Excellent penetration takes place even with firm winding, and better fixation of twist is obtained. J. W. B.

Applying Liquid to Filamentary Material. C. F. Dulken, G. Westwater, and H. C. Sonntag. *BP* 670,962

Processing liquid, e.g. for conditioning, dyeing, lubricating, or twist-setting, etc., is finely atomised, the density of the mist being gradually reduced, and directed on to the surface of a yarn package while the latter is being wound or unwound. If desired the mist may be transformed into a liquid film immediately before application to the surface. J. W. B.

Finishing Braided Threads. Wan-Ke-Wan Thread Co. *USP* 2,575,981

The thread passes from the braiding die through a sizing bath, and is then dried by air at room temperature, being maintained under high tension throughout. Maintaining tension in the thread enables it to dry much more quickly than it would do if relaxed. C. O. C.

Beetling. Bleachers' Assocn. and Lockers (Engineers). *BP* 669,985

A variety of finishes can be imparted to fabric by causing solid beaters to vibrate against it at a rate higher than that of a beetle, preferably > 1000 blows/min. The length of stroke may be quite small, e.g. 0·6 in. The effect produced is readily controlled, and the rate of output is greater than with customary beetling machines. C. O. C.

Crêping Nylon. A. L. Dorgin. *USP* 2,575,908

A yarn containing nylon and raw silk is given suitable twist and is then woven or knitted. The fabric obtained is then boiled off in the usual manner. As the silk shrinks on being boiled off, it imparts a crêpe or crinkled effect to the nylon, which effect is made permanent by heat-setting. The silk is removed by treatment with a hot caustic solution before or after the heat-setting. C. O. C.

Calender-finishing Nylon or Saran Fabric. Aspinook Corpn. *USP* 2,577,957

A calender, including embossed, finish fast to washing is produced upon nylon or Saran fabrics by treating them with an amino-formaldehyde or carbamide-aldehyde resin, a mixture of urea and thiourea condensates, or a mixture of thioureas and melamine-formaldehyde resins before calendering at 350–400°F. and 4–6 tons pressure for 0·5 sec. and then curing at 250–320°F. C. O. C.

Expansible Cloth. Cincinatti Industries. *USP* 2,573,773

Any type of cloth can be made expansible by treating it with an adhesive so that the adhesive does not penetrate the cloth but is applied only to the crests of the threads and not as a continuous film. The treated cloth is then caused to adhere to a crêping cylinder, from which it is removed by a crêping knife or doctor. C. O. C.

Water-repellent Finish. National Lead Co. *BP* 669,772

The material is impregnated with a zirconium salt of a water-soluble fatty acid and then treated so as to produce a water-insoluble compound in the fibre, e.g. by hydrolysing the Zr compound at high temperature or by raising the pH. C. O. C.

Water-repellent Finish. E. Tauszig. *BP* 669,747

A good water-repellent finish is obtained without the need for high-temperature drying by using a solution containing aluminium chloride (containing traces of iron) and an ammonium salt of a weak organic acid. The solution should have pH 5·5–5·5 and density 9·5–10·0°Bé. The temperature of the liquor should not be > 40°C. C. O. C.

Ink-receptive Surface on Tracing Cloth. U. S. Secretary of the Interior. *USP* 2,576,921

Tracing cloth of good ink receptivity and dimensionally stable under change of humidity is obtained by using as the coating a mixture of starch, gelatin, alum, alcohol, and formaldehyde. C. O. C.

Water - impermeable, Water - vapour - permeable Fabrics coated with Polydiene Rubber. Wingfoot Corpn. *USP* 2,575,577

The fabric is coated with a composition containing a polydiene rubber and a large proportion of a hydrophilic diatomaceous earth together with the necessary accelerators, antioxidants, and pigments. The resulting coating is permeable to water vapour but impervious to liquid water. C. O. C.

Bonding of Cellulose Fibres to Rubber. Courtaulds. *BP* 670,436

Better bonding is obtained between cellulose and rubber if the cellulose has been treated so as to contain side-chains containing unsaturated carbon-carbon groups before the assembly is vulcanised. Thus the cellulose

fibres may be impregnated with allyloxymethylpyridinium chloride and then baked during vulcanisation. C. O. C.

Prevention of Damage to Textiles by Sunlight (VI p. 276).
N.54 Acrylic Fibre—Scouring, Dyeing, and Finishing (VIII p. 281).
Continuous Presetting and Dyeing of Tricot Fabric (VIII p. 281).

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Alkali Solubility of Pulp. K. Wilson, E. Ringstrom, and I. Hedlund. *Svensk Papperstidning*, **55**, 31–37 (31 Jan. 1952).

Determinations of the solubility of pulp in NaOH solutions up to 18% concentration show the solubility to reach a maximum at about 10% NaOH, at which β-cellulose has its maximum solubility, whilst γ-cellulose increases in solubility up to 20% NaOH. As β-cellulose is only slightly soluble in 18% NaOH, the total solubility in 18% NaOH is a measure of the γ-cellulose content, and the difference between the solubilities in 10 and 18% NaOH is an approximate measure of the β-cellulose content. The significance of changes in β- and γ-fractions in cooking, bleaching, and rayon manufacture is discussed. S. V. S.

Possibility of Accelerating the Beating Rate of Cellulose Pulp. G. Centola and D. Borruso. *Industrie della Carta*, **6**, 41–47 (April 1952).

The results of beating tests carried out with the Jokro mill on bleached kraft, bleached strong sulphite, and cotton linters purified by acetylation, in the presence of distilled, hard, and soft water and solutions of different salts, are discussed. From these tests and those reported in the literature by Cohen *et al.*, it is deduced that the action of the cations and anions tested nearly always delays the rate of beating of pulp compared with the beating curve in distilled water. In an endeavour to find substances with a possible accelerating effect on beating, the direct dyes of the benzidine class were examined, a choice made from consideration of analogies between methyl cellulose solutions and suspensions of fibres hydrated by means of mechanical beating, and from an examination of the modification of certain properties of methyl cellulose in aqueous solutions in the presence of direct dyes. In beating tests of different pulps in the presence of Congo Corinth and Congo Red (2% on the weight of pulp), a very considerable increase of the beating rate was found together with a marked improvement in the strength characteristics of paper sheets prepared in the laboratory by the Rapid Köthen method. Further work is needed to establish the mechanism of the action of the dye. S. V. S.

Some Properties of Certain Dyes and their relation to Two-sidedness of Paper. A. J. M. Draper. *Proc. Tech. Sects. Brit. Paper & Board Makers' Assocn.*, **32**, 751–770 (Dec. 1951).

Experiment shows that certain acid dyes tend to migrate towards the hot surface when a sheet of paper dyed with them is dried by means of a heated metal surface, giving rise to a two-sided effect not shown by similar sheets that have been air-dried. A study of dye properties in relation to papermaking materials and the reaction of dyes with the size-alum precipitate shows that two-sidedness decreases with higher degree of aggregation of the dyes and is affected by solubility, capillarity, temperature, and the presence of aluminium rosinate. S. V. S.

Physical Characteristics of α-, β-, and γ-Cellulose. B. G. Ränby. *Svensk Papperstidning*, **55**, 115–124 (29 Feb. 1952).

Electron microscopic examination of dispersed spruce holocellulose shows it to comprise micelle filaments or strings (cellulose) and a dispersed phase (hemicellulose). α-Cellulose from bleached softwood pulps is built up of micelle filaments, whilst the γ-fraction contains no filaments. The β-fraction is a mixture of short filament fragments and small particles. X-Ray examination shows α- and β-cellulose to have the same lattice (cellulose II), but the γ-lattice is quite different. It is concluded that the cellulose filaments in spruce and pine pulp fibre form a pure phase with a definite boundary to the other carbohydrates, an assumption in accord with the hypothesis of Giertz *et al.* (*ibid.*, **54**, 335 (1951)) that the γ-fraction is identical with the wood polyoses and with the amorphous interfibrillar substance of a pulp. S. V. S.

Reaction of Cellulose with Formaldehyde. R. E. Wagner and E. Pacsu. *Text. Research J.*, **22**, 12–20 (Jan. 1952).

A new method for treating cellulose with formaldehyde in the presence of acid catalysts as mild as boric acid is described, producing methylene cellulose containing up to 6·5% covalently linked formaldehyde. It is shown that the formaldehyde preferentially substitutes the secondary hydroxyl groups of cellulose. A. B.

Homogeneous Acid Hydrolysis of Methyl Cellulose. I—Determination of Reaction Rate by Reducing Group Measurements. G. C. Gibbons. *J. Textile Inst.*, **43**, T 25–T 37 (Feb. 1952); **II—Change of Viscosity and Molecular Weight during Hydrolysis.** Idem. *Ibid.*, **43**, T 38–T 52 (Feb. 1952); Correction. *Ibid.*, **43**, T 123 (March 1952).

I—The homogeneous hydrolysis of methyl cellulose in dil. HCl is followed by the change in end-group concentration as measured by hyponodite oxidation of the aldehyde groups. The initial reaction is unimolecular and is an H^+ catalysis with an activation energy of 30,150 g. cal.; reaction rate is determined by the decomposition of an intermediate complex formed by transfer of a proton to a cellulose ether molecule prior to hydrolysis. When the degree of degradation is large, the specific reaction rate increases owing to the greater rate of hydrolysis of the terminal glucose units; the rate of hydrolysis decreases as the methoxyl content increases from 17 to 29%. In addition to combined aldehyde groups in 1:4-glucosidic bonds, there are a few which are not in the main chain and which are liberated much more rapidly in acid solution.

II—Relations between intrinsic viscosity and time of hydrolysis in 1·19 N-HCl are obtained for various fractionated and unfractionated methyl celluloses and are compared with the predictions of a theory of random degradation of chain molecules. Almost quantitative agreement is obtained with fractions from homogeneously methylated cellulose; the hydrolysis is therefore random and the viscosity decrease due solely to the scission of 4-β glucosidic bonds. The intrinsic viscosity decreases more rapidly for an unfractionated methyl cellulose than for a relatively uniform fraction of the same average degree of polymerisation. This is predicted by the theory, and the difference in rate of decrease of viscosity may be calculated from the observed distribution curve of the non-uniform methyl cellulose. Differences between the data for fractions derived from commercial methyl celluloses and those from methyl celluloses prepared by homogeneous methylation are considered to be due to non-random methoxyl group distribution along commercial methyl cellulose chain-molecules, resulting in initial preferential hydrolysis at the chain centres. J. W. B.

Physicochemical Properties of Ethyl Hydroxyethyl Cellulose. I. Jullander. *Svensk Papperstidning*, **55**, 197–211 (31 March 1952).

Various physicochemical properties of water-soluble ethyl hydroxyethyl cellulose in the solid state and in solution were investigated, and a method for determining the ethoxyl and hydroxyethyl content is described. The properties of solutions, which are pseudoplastic, are discussed, including viscosity, turbidity, and surface tension, and the efficacy of a number of anti-foaming agents is determined. S. V. S.

Methylation of Carbohydrate using Diazomethane. L. Hough and J. K. N. Jones. *Chem. and Ind.*, 380 (26 April 1952).

Methylation of commercial wheat starch with diazomethane, catalysed by water or methanol, proceeds fairly rapidly up to a methoxyl content of 20%. Subsequent rise is slower. A product containing 26% gives a red-brown and not a blue colour with iodine solution, and acid hydrolysis gives a mixture of methyl glucoses. Paper partition chromatography indicates glucose and mono-, di-, tri-, and tetra-methyl glucose. It is suggested that under suitable conditions complete methylation of starch and perhaps other carbohydrates will occur. J. W. B.

Evidence from Infrared Spectroscopy for the Composition of Certain Polysaccharides. S. F. D. Orr, R. J. C. Harris, and B. Sylvén. *Nature*, **169**, 544–545 (29 March 1952).

Chondroitin sulphuric acid from cartilage and hyaluronic acid (*N*-acetylglucosamine–glucuronic acid polymer) from various sources are studied by infrared spectroscopy.

J. W. B.

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Irreversible Inactivation of the Cationic Groups of Collagen by High-molecular Acids. K. H. Gustavson. *Nature*, **169**, 757–758 (3 May 1952).

Portions of standard hide powder (acid-binding capacity 0·92 mg. equiv. HCl/g. collagen) equivalent to 2·0 g. collagen are shaken for 48 hr. with 0·1 N. lignosulphonic acid (50 ml.) and freed from sorbed substances by washing, and the residual soln. and washings made up to 500 ml. Determination of the amount of lignosulphonic acid irreversibly combined with the collagen, and of the collagen, sulphur, and free basic groups in the dried lignosulphonic acid–collagen compound shows the stoichiometric equivalent of the acid to be fixed by the protein; the compound is inert towards HCl. It is concluded that the large lignosulphonic acid molecules penetrate into the interior of the collagen fibrils and react with the individual chains of the protein.

In the reaction between hide powder and 0·1 N. polymetaphosphoric acid, however, it is found that not more than two-thirds of the available phosphate groups in the molecule can find positively charged partners in the collagen lattice, because of unfavourable steric conditions. The large lignosulphonic acid molecule is, on the other hand, adaptable to the protein lattice. J. W. B.

Pore Size of Keratin. L. G. Jagger and J. B. Speakman. *J. Textile Inst.*, **43**, T 67–T 68 (Feb. 1952).

Human hair fibres are stretched 30% in dry *n*-propyl alcohol after 1 and 14 days' immersion. There is no difference in the work required, showing that reaction with the alcohol is complete in one day; this confirms that the fine structure of dry fibres is inaccessible at 22·2° C. to molecules larger than *n*-propyl alcohol. This refutes the contention by Alexander *et al.* (*Biochem. J.*, **48**, 629 (1951)) that the concept of maximum pore size is erroneous. Their esterification of –COOH groups in wool with butyl and amyl alcohols is carried out under entirely different conditions and cannot be used in argument. J. W. B.

Formation of Keratin during the Growth of Hair. R. Heilingötter. *Melliand Textilber.*, **32**, 824–826 (Nov. 1951).

Mercer has reported on the formation of keratin during the growth of hair, and has distinguished, on the basis of polarisation, X-ray, and chemical methods, five horn-forming zones between the papilla and the shaft of the hair. These results have been confirmed by the author by means of morphological examination of longitudinal sections cut through the human scalp. B. K.

Dressing and Dyeing Fur Skins. M. Banerjee. *Tanner*, **5**, (10), **23**, (11), 22; **6**, (1), 26 (1951); *J. Amer. Leather Chem. Assocn.*, **46**, 62 (Jan. 1952).

Fur skins are soaked only for a time sufficient to rehydrate them. Fresh skins are soaked but 1–2 hr., dry skins considerably longer in 0·125% sodium hypochlorite soln. After fleshing and thorough washing, the skins are given a pickle of salt and sulphuric or formic acid. About 2·5% of formaldehyde is added to the pickle bath. Following this treatment, the stock is treated with retanning oils such as fish and linseed, and egg yolk. This is known as the Leipzig process. In alum dressing it is customary to immerse the skins overnight in a solution containing potash alum (4 parts), salt (6), and water (100). Pelts dressed in this manner would be thin were it not for the subsequent treatment with egg-yolk and flour, or a combined alum-oil treatment with tanning paste brushed on the flesh. The paste consists of alum (3 parts), salt (1), flour or French chalk (6), and egg-yolk (3–4). Alum-dressed skins are less stretchy than Leipzig-dressed pelts. They can be stretched appreciably when wet, and retain their stretched shape when dry. They are heavier than the Leipzig skins. Bancoral A, a proprietary product which appeared in 1936, contains 30–32 aluminium oxide, and has a basicity of 50. It is free from neutral salts and is used similarly to chrome. The stock does not have to be pickled, but in such case gives a leather of insufficient stretch. A better method is to pickle the stock for 2–3 days, then add 10–15 g. Bancoral A and 40–60 g. salt per litre of water. The pH of the liquor is 2·5–3·5. If it is found necessary to neutralise the pelts, this can be done with bicarbonate. Formaldehyde tannage of pelts is accomplished by first pickling, then treating in a 1% solution of commercial formaldehyde, and after an hour adjusting the pH to 9. Tanning is completed in 3–4 hr. in the paddle. Skins are then drained and oiled on the flesh with a 50 : 50 sulphonated cold-water mixture. Vegetable dressing in a weak solution of gambier, myrobalams, wattle, or other extracts can follow after chrome or alum tannage. Such skins are thick, soft, and less stretchy. In the retannage, the hair gets more or less tinted. Gambier tannage is accomplished by painting the flesh with a paste consisting of aluminium sulphate (1 lb.), salt (1 lb.), water (1 litre), gambier (30 oz.), and water containing sufficient flour to ensure a thin paste (2 gal.). The flesh is given two or three coats, and when the stock is dry it is given two or three additional coats. It is then rinsed with 1·0 oz. borax per gal. of water and given the usual fat liquor. Chrome tanning is done in a 3–4% Cr_2O_3 solution with basicity of 33%. It is accomplished in 4–5 hr. Stock is horsed up over night. Killing is necessary on unbleached skins in order to remove surface grease prior to dyeing. This is done with a solution of ammonia, salt, and sulphonated oil. They are then rinsed with water and finally with a 0·1% acetic acid solution. Another killing formula consists of an aqueous solution of ammonia and sodium hydrosulphite. Dyeing can be done at temperatures ranging from room to boiling. Furs and wools require acid dyes, the quantity ranging from 0·5 to 2·0% on pelt dry weight. Acid dyes are exhausted with an equal amount of formic acid. Fur and wool skins should be oiled on the flesh only, so as to avoid any gummy residue in the fur or wool. A satisfactory oil mixture, applied by swab or spray, consists of sulphonated oil (1 part), neatsfoot (1), ammonia water (3), and sulphonated neatsfoot oil (5). Another oiling mixture consists of mineral oil (2·5) and sulphonated cod (2·0). C. J. W. H.

Investigations on Fur Dressing and Finishing. I—Microscopic Anatomy of Some German Fur Skins. F. Stather. *Ges. Abhandl. deutsch. Lederinst.*, No. 4, 3–16 (1950). **II—Influence of the Most Important Operations in Fur Dressing on the Properties of the Fur.** F. Stather, H. Herfeld, and K. Sohre. *Ibid.*, 17–18. **III—Formaldehyde Dressing.** H. Herfeld and K. Sohre. *Ibid.*, No. 5, 78–92. **IV—Differences between Leather Tanning and Fur Dressing.** F. Stather and K. Sohre. *Ibid.*, No. 6, 40–49 (1951). **VII—Aluminium Formaldehyde Dressing of Furs.** H. Herfeld. *Ibid.*, No. 7, 21–33; *Chem. Abs.*, **46**, 2829–2830 (25 March 1952).

I—Descriptive, 38 photomicrographs.

II—Scientific knowledge of leather tanning is largely inapplicable to fur dressing, because the properties desired, apart from retention of hair, differ from those desired in leather. The leather of dressed furs must be thin, soft, and supple; a leathery character is undesirable. They should receive the minimum tannage that will stabilise them to water. Standards are given for minimum shrink temperature (75° C.); ptability on repeated washing with detergents; fat content (4–10%), mineral matter other than Cr_2O_3 and Al_2O_3 (not > 8%), water-extractable matter (not > 8%), pH of extract (3·5–7·0); and various strength characteristics. Trials made with 24 experimental batches each of 10 rabbit skins were treated to various combinations of pickling and tanning processes. The desired properties were obtained only when the skins were given either a strong acid–salt pickle or an enzyme treatment before tanning. Best results were obtained by acid pickling without tanning, but such skins have poor resistance to water and show marked loss of strength on storage. Adequate stability to water was attained without undue leathering by tanning with HCHO, HCHO and alum, or Cr salts, but not with alum alone, replacement syntans, or HCHO applied before pickling.

III—Small batches of formaldehyde de-tanned rabbit skins had a minimum shrink temperature > 70°C., except when they had been brought to pH < 6 by acidification or retanning with alum; they contained 0·05–0·14% HCHO. Skins containing 0·18% HCHO shrank at 74°C. The HCHO content of hair was 50–100% that of the leather. Data are given on the amount of HCHO fixed by hide powder at pH 7–8 as a function of time and concentration. On bringing to pH 2 with HCl or HCOOH, in presence or absence of NaCl, about 66% of the combined HCHO was removed from undried HCHO-tanned hide powder. Less HCHO was displaced for powder which had been air-dried, and the amount decreased with temperature and length of storage. Only 25% of the combined HCHO was displaced after storing for 6 weeks. Skins were treated with enzyme at pH 4·4 and tanned with various amounts of HCHO and Na_2CO_3 at pH 6·6–8·5. One lot was pretanned with alum. The minimum shrink temperature was satisfactory for all. Too much HCHO gave undesired leathering. The maximum permissible pH for furs has been raised from 7 to 8.

IV—Comparative tanning tests were made on cowhide with and without dehairing, alum, Cr, HCHO, syntans, and HCHO–alum tannings being used. In every case the haired skins were harder and stiffer than the dehaired skins. Penetration and fixation of Al, Cr, and syntans were much slower in the case of the haired skins. Penetration was mostly from the flesh side.

VII—Trials have shown that the amount of potash alum used in pretanning, and of HCHO, should be kept to a minimum to avoid undue leathering. Optimum results were attained by pretanning with not > 25% K alum and retanning with 1% of 30% HCHO on the soaked and centrifuged skin. The sole advantage given by the Al pretan is reduction of the absorption of water by the skins.
C. O. C.

Mechanism of Enzyme Action. S. J. Leach and H. Lindley. *Nature*, **169**, 360–361 (1 March 1952).

It is considered that enzymic properties of a protein molecule are due to the order and arrangement of the amino-acid side-chains rather than to a strongly hydrogen-bonded system of peptide links. A list is given of enzymic and non-enzymic proteins, various side-chain ratios being tabulated. A scheme is suggested, serine and asparagine being used as examples, whereby enzymic molecules contain frequent inter-chain H-bonds of carboxyl-hydroxyl type, which reinforce the inter-chain peptide H-bonding, thus forming a highly resonating network, over which electron flow can occur. J. W. B.

Pauling Corey α-Helix in Synthetic Polypeptides. W. Cochran and F. H. C. Crick. *Nature*, **169**, 234–235 (9 Feb. 1952).

The X-ray diffraction picture of highly crystalline synthetic poly-α-methyl-L-glutamate is readily explained by means of a Fourier transform calculated on the basis of an atom repeated at regular intervals on an infinite helix, thus strongly confirming the Pauling–Corey α-helix theory. J. W. B.

Structure of Synthetic Polypeptides. C. H. Bamford, L. Brown, A. Elliott, W. E. Hanby, and I. F. Trotter. *Nature*, **169**, 357–358 (1 March 1952).

Use of new techniques with an improved sample of the α form of poly-γ-methyl-L-glutamate and samples of other synthetic polypeptides gives X-ray diffraction photographs all showing meridional reflections at 1·47–1·50 A. A detailed discussion precedes the claim that these data strongly support the 18/5 helix theory; some observations are, however, recorded which do not readily fit in.
J. W. B.

Influence of Bleaching Natural Furskins on the Properties of the Hair and Leather (VII p. 280).

XIII—RUBBER; RESINS; PLASTICS

Dyes fast to Vulcanisation. H. Hansen. *Deutsche Textilgew.*, **53**, 386–388 (1951); *J. Textile Inst.*, **43**, A 162 (March 1952).

Dyes which are fast to (i) cold curing and (ii) steam curing and hot-air curing processes are listed, and some sources of failure are indicated. C. J. W. H.

Synthesis of "Block" Copolymers. A. S. Dunn and H. W. Melville. *Nature*, **169**, 699–700 (26 April 1952).

Some properties are described, together with methods of preparation, of methacrylic acid and styrene copolymers in which blocks of one type of residue recur regularly, to be succeeded by blocks of the second residue. J. W. B.

Diaminotriazine Group—Recent Approaches and Applications. G. V. Austerweil. *Chem. and Ind.*, 372–375 (26 April 1952).

A survey of the uses of compounds containing the diaminotriazine group includes the formation of resins suitable for textile application. J. W. B.

PATENT

Stabilising Vinyl and Vinylidene Chloride Polymers to Light and/or Heat. B. F. Goodrich Co. *USP* 2,574,987

Imides containing the group –CO·NH·CO– are used as stabilisers. C. O. C.

Linear Copolymers of the Polyamide Type (VI p. 279).

XIV—ANALYSIS; TESTING; APPARATUS

Thickness Measurements by means of β-Rays. I—General Survey. T. Westermark. *Svensk Papperstidning*, **55**, 278–286 (30 April 1952).

The principles, precision, applications, and future possibilities of the use of β-rays for thickness determination, etc., and suitable radioactive isotopes for the purpose, are discussed in detail. S. V. S.

Fourth Annual Review of Analytical Chemistry—Applications of Analytical Developments. *Anal. Chem.*, **24**, 232–300 (Feb. 1952).

Individual headings include Coatings, Natural and Synthetic Rubbers, and Water Analysis. J. W. D.

Rapid Potentiometric Determination of Chloride at Low Concentrations. W. J. Blaedel, W. B. Lewis, and J. W. Thomas. *Anal. Chem.*, **24**, 509–512 (March 1952).

Voltage difference is measured between two Ag/AgCl electrodes in a concn. cell, one arm of which contains the soln. under examination and the other a standard chloride soln. A nomogram relates the reading obtained with the concn. of chloride in the test soln. The method has a limiting chloride concn. of 2×10^{-6} M. in soln. ca. 1 M. in H_2SO_4 and/or Na_2SO_4, and a relative error of ca. 2% at chloride concn. from 3×10^{-4} to 5×10^{-3} M. Unlike the usual nephelometric or turbidimetric methods, the present method is reliable in soln. of high ionic strength. Bromide and iodide damage the electrodes and must be absent; chloride-complexing agents interfere. Procedure, and construction of a cell suitable for routine work, are described. J. W. D.

Semi-automatic Gas Micromethod for Rapid Determination of Nitrogen in Organic Compounds. H. Gysel. *Helv. Chim. Acta*, **35**, 802–807 (May 1952).

Manipulative details with description of apparatus are given for the semi-automatic gas-volumetric microdetermination of nitrogen. The method has the special feature of not being susceptible to the speed of combustion, and thereby affords a high degree of accuracy while enabling the rapid determination of nitrogen; it is particularly serviceable for the combustion of substances which are usually difficult to analyse and which require high combustion temperatures. H. H. H.

Standardisation of Methods of Testing Auxiliary Products. G. Schwen. *Melliand Textilber.*, **32**, 939–940 (Dec. 1951).

Results are tabulated of tests carried out on five wetting agents in seven different laboratories in soft and hard water at different temp. As a result, details are given of a proposed standard testing method using a sinker. B. K.

Continuous Method of Extraction for High Proportions of Unsaponifiable Matter. P. Sherman and J. E. Dillistone. *Chem. and Ind.*, 130 (9 Feb. 1952).

Standard methods of extracting unsaponifiable material from saponified oils have proved unsatisfactory because of emulsion formation and retention of soap in the extraction solvent. To overcome these difficulties a continuous extractor is used, based on the standard apparatus

for extraction of solutions with lighter solvents. Samples (5 g.) are saponified for 1 hr. with 2 N. alcoholic KOH (50 ml.), and the soln. is transferred to the column with enough water to bring the level approx. 3 in. below the side arm. Extraction with ethyl ether (better than petrol ether) is carried out for 6 hr., the remaining ether displaced over into the flask, and the extract transferred to a separating funnel and dealt with in the usual way.

J. King. *Ibid.*, 217 (8 March 1952).

Observations are made on the liquid-liquid extraction method for determining unsaponifiable matter, with suggestions for more efficient operation.

K. A. Williams. *Ibid.*, 379–380 (26 April 1952).

Criticism of Sherman and Dillistone's note, and a defence of *B.S.* 684 : 1950. J. W. B.

Determination of Molecular Weight of Starch Polysaccharides. S. Nussenbaum and W. Z. Hassid. *Anal. Chem.*, **24**, 501–503 (March 1952).

The reducing end groups (·CHO) are oxidised by alkaline ferricyanide in presence of cyanide, and ferric sulphate is added to form Prussian Blue, which is stabilised by gum ghatti. The colour intensity may be determined photometrically. Stoichiometric relationship obtains between the observed reducing values of glucose, maltose, and heptaose, and there is close agreement between mol. wt. obtained by this method and values obtained by osmotic pressure measurements. This latter agreement holds good for the smaller amyloses, amylodextrins, and amylopectins, but breaks down when the mol. wt. is > 3000.

J. W. D.

Quantitative Analysis of Reducible Carbohydrates by means of Sodium Borohydride. B. Lindberg and A. Misiorny. *Svensk Papperstidning*, **55**, 13–14 (15 Jan. 1952).

A new method for estimating aldoses and ketoses involves reduction of the sugars in aqueous solution with a known excess of Na borohydride, followed by decomposition of the excess of the reagent and measurement of the hydrogen evolved. A known quantity of the sugar (0·3–0·4 millimole) is placed in the middle chamber of a three-legged (arrowhead) reaction vessel and dissolved in 4 ml. of 0·1 M. boric acid solution. The other legs contain 3 ml. of 0·13 M. sodium borohydride in 0·1 N-NaOH and 1 ml. of 2 N-H_2SO_4 respectively, and the vessel is connected to a 50-ml. gas burette. The reduction is started by tipping the borohydride into the sugar solution, and after 2 hr. reduction (at pH ca. 9) the H_2SO_4 is added to the solution. After a further 15 min., during which the vessel is shaken from time to time, the volume of hydrogen evolved is measured. A blank test is carried out, but the 2 hr. delay before adding the H_2SO_4 is then unnecessary.

S. V. S.

Microtitration of Amines. R. T. Keen and J. S. Fritz. *Anal. Chem.*, **24**, 504–506 (March 1952).

The amine is dissolved in an inert solvent such as chlorobenzene and titrated with $HClO_4$ which has been standardised against diphenylguanidine. The end-point may be ascertained potentiometrically using a glass/silver wire electrode system or, preferably, by using methyl violet as a visual indicator. As little as 20 $\mu g.$ of an amine may be titrated with 0·001 N-$HClO_4$. Amine mixtures may be separated by microextraction with suitable solvents, and the extracts titrated direct. J. W. D.

Coulometric Titration of Aniline. R. P. Buck and E. H. Swift. *Anal. Chem.*, **24**, 499–501 (March 1952).

Straightforward coulometric titration of aq. soln. of aniline with bromine is unsatisfactory, as the rate of reaction is slow and the end-point difficult to determine. The usual volumetric procedure of adding excess bromine and back-titrating after allowing time for reaction is adapted to the coulometric procedure by using the cuprous–cupric copper couple as a coulometric intermediate. The aniline is titrated by generating an excess of bromine, allowing time for reaction (in presence of cupric sulphate), and then back-titrating the excess with electrolytically generated cuprous copper. The procedure is fully described. J. W. D.

Determination of Dimethylaniline in Ext. D&C Blue No. 1 and 2. K. S. Heine. *J. Assocn. Off. Agric. Chem.*, **34**, 799–801 (1951): *Chem. Abs.*, **46**, 2964 (10 April 1952).

The dimethylaniline is steam-distilled from an alkaline solution of the dye, identified, and determined spectrophotometrically by measurement in dil. NH_4OH at 245 $m\mu$. C. O. C.

Determination of Uncombined *p*-Aminoacetanilide in Ext. D&C Red No. 1. K. S. Heine and W. J. Sheppard. *J. Assocn. Off. Agric. Chem.*, **34**, 802–804 (1951): *Chem. Abs.*, **46**, 2962 (10 April 1952).

p-Aminoacetanilide is ether-extracted from the dye, then extracted from the ether with approx. 0·1 N-HCl, and finally determined spectrophotometrically by measuring the absorbency at 241 $m\mu$. C. O. C.

Breakdown of the Lambert–Beer Law. H. E. Rose. *Nature*, **169**, 287–288 (16 Feb. 1952).

Transmission of light through suspensions of silica sand, zircon white powder, and ilmenite black powder is studied in a photometer containing a variable stop between cell and suspension. Significant deviation from the Lambert–Beer law is found with silica sand if a large stop is used; the highly reflective zircon powder shows similar properties; but deviation with non-reflective ilmenite is much smaller. It is suggested that deviations which occur in practice arise from the collection of light, scattered from suspended particles, by a photometer subtending an appreciable solid angle at the centre of the suspension. For concn. $< 0{\cdot}2$ g./litre no significant deviations occur if this angle is not $> 0{\cdot}00025$ solid radian. J. W. B.

Determination of the "Extinction Coefficient"–Particle Size Relationship for Spherical Bodies. H. E. Rose. *J. Appl. Chem.*, **2**, 80–88 (Feb. 1952).

The problem of determining the particle size of powders by measuring the opacity of a suspension is reviewed. Errors in relationships between particle size and extinction coefficient, measured photoelectrically, are due to the difficulty of obtaining spherical particles of uniform diameter below 15 μ., and also to differences in the solid angle subtended by the photoelectric receiver. Aggregation of the particles may also interfere. These sources of error are eliminated by using an apparatus in which the receiving photocell subtends a constant solid angle of 1°. Fused glass spheres or selected sands are used, and separated by repeated levigation and sedimentation. Aggregation is avoided by using suspensions of low concn. Equations are derived for the evaluation of the extinction coefficient of spherical particles of limited size range, and correction factors for non-sphericity are given. Experimental curves of extinction coefficient against particle diameter are found to be in good agreement with the theoretical solutions of Stratton and Houghton (*Phys. Rev.*, **38**, 159 (1931)) for particle sizes up to 15 μ., and of Brillouin (*J. Appl. Phys.*, **20**, 1110 (1949)) for diameters > 15 μ. A. J.

Identification of Azo Dyes by Spectrophotometric Identification of their Reduction Products. I—Compounds which give Simple Amines or Diamines on Reduction. J. H. Jones and L. S. Harrow. *J. Assocn. Off. Agric. Chem.*, **34**, 831–842 (1951): *Chem. Abs.*, **46**, 2805 (25 March 1952).

When volatile amines are produced by reduction the procedure is—(1) reduce water-soluble dyes with $Na_2S_2O_4$ and oil-soluble dyes with $TiCl_3$; (2) distil the volatile amines into aq. HCl; (3) make distillate alkaline and extract with ether; (4) re-extract the amines from the ether with 0·2 N-HCl; (5) determine the ultraviolet absorption spectra of the recovered amines in dil. HCl and approx. 0·1 N-NaOH; and (6) compare the resulting spectra with those of known amines. When non-volatile amines are formed during reduction, they are isolated from the reduced solution or from the residue from the steam distillation by making the solution alkaline and extracting it with ether. These methods can be used for samples containing only a few milligrams of azo dye. C. O. C.

Metal Indicators. V—Iron Complexes of 2 : 3-Dihydroxynaphthalene-6-sulphonic Acid. J. Heller and G. Schwarzenbach. *Helv. Chim. Acta*, **35**, 812–817 (May 1952).

The pK constants of the phenolic hydroxyl groups of 2:3-dihydroxynaphthalene-6-sulphonic acid ($4{\cdot}0 \pm 0{\cdot}1$ and $12{\cdot}16 \pm 0{\cdot}08$) are compared with those of catechol-disulphonic acid ($7{\cdot}66 \pm 0{\cdot}02$ and $12{\cdot}6 \pm 0{\cdot}2$) and of chromotropic acid ($5{\cdot}37 \pm 0{\cdot}01$ and $15{\cdot}6 \pm 0{\cdot}3$). The anion R^{3-} of the first named is found to form three ferric

complexes FeR, FeR_2^{+}, and FeR_3^{++}, the stability constants of which are 19·88 ± 0·1, 14·47 ± 0·2, and 9·87 ± 0·15 respectively. H. H. H.

Substituted Benzidines and Related Compounds as Reagents in Analytical Chemistry. IX—Naphthidine- and 3:3'-Dimethylnaphthidine-sulphonic Acids as New Redox Indicators. R. Belcher, A. J. Nutten, and W. I. Stephen. *J.C.S.*, 1269–1274 (April 1952).

Paper Chromatography of Fluorescein and the Halogenated Fluoresceins. C. Grauchen. *J. Assocn. Off. Agric. Chem.*, **34**, 795–799 (1951); *Chem. Abs.*, **46**, 2875 (10 April 1952).

Two solvents (*a*) NH_4OH (1 + 99) saturated with isoamyl alcohol and (*b*) a mixture of butanol (200 ml.), water (88), conc. NH_4OH (2), and alcohol (40)—used for separating fluorescein dyes by two-dimensional paper chromatography, gave most satisfactory results when (*a*) was used for the initial development. The R_f values are reported for 14 fluorescein dyes with both solvents. C. O. C.

Coal-tar Colours. X—Ext. D&C Green No. 1. C. Stern. *J. Assocn. Off. Agric. Chem.*, **34**, 804–807 (1951); *Chem. Abs.*, **46**, 2962 (10 April 1952).

Purification of Ext. D&C Green No. 1 is described. Aqueous solutions of the pure dye buffered with NH_4 acetate follow Beer's law, thus making possible spectrophotometric determination of the dye. Titration with $TiCl_3$ is also a practicable method. C. O. C.

Determination of Moisture in Pigments with the Karl Fischer Reagent. J. L. Bush. *National Paint, Varnish & Lacquer Assocn., Sci. Section, Circ.* No. 748, 15–22 (1951); *Chem. Abs.*, **46**, 2961 (10 April 1952).

A sample of pigment suspended in methyl alcohol is titrated with the Karl Fischer reagent. Results on various pigments agree with oven drying and toluene-distillation methods. This method cannot be used for pigments, such as Cu_2O, cadmium red, and certain pigments containing Pb and Zn, which react with the Karl Fischer reagent. C. O. C.

Use of Metal Complexes in Identification of Flavonoid Pigments. T. B. Gage and S. H. Wender. *Proc. Oklahoma Acad. Sci.*, **30**, 145–148 (1949) [published 1951]. *Chem. Abs.*, **46**, 3463 (25 April 1952).

Ultraviolet absorption spectra of rutin (I), xanthorhamnin (II), quercetrin, robinin, isoquercitrin, quercetin, and naringin were determined alone and in presence of $AlCl_3$. I and II are distinguishable thus only with $AlCl_3$, and some other pairs not even then. C. O. C.

New Test for Identification of Organic Pigments. R. L. P. R. Hepworth. *Chem. and Ind.*, 272 (22 March 1952).

To about 0·01 g. pigment in a spotting tile cavity is added a saturated aqueous solution of trichloroacetic acid. The colour is noted, a few drops of conc. HNO_3 added, and the colour again noted. Phthalocyanine Blue gives no first change but becomes intensely violet, even in presence of a large excess of inert material, on adding acid. Phthalocyanine Green gives no change. Phosphotungstic (PTA) and phosphomolybdic (PMA) lakes may be distinguished from each other and from Pigment Green B and its lakes; Rhodamine PTA and PMA lakes may be distinguished from all other red pigments. Monolite Yellow GTS gives a darker colour with HNO_3 than the Hansa yellows. Only very limited application to azo pigments. J. W. B.

Ethylenediaminetetra-acetic Acid as Aid in Analysis of Certain Coal-tar Colour Lakes. N. Ettelstein. *J. Assocn. Off. Agric. Chem.*, **34**, 792–794 (1951); *Chem. Abs.*, **46**, 2805 (25 March 1952).

This reagent in approx. 50% alcohol is recommended for dissolving Ca, Ba, and Sr lakes of certain certifiable dyes, which are difficultly soluble in common solvents. The dyes are determined spectrophotometrically. Typical results are given. C. O. C.

Paper Partition Chromatography of Sulphonamides. G. L. San and A. J. Ultee. *Nature*, **169**, 586 (5 April 1952).

Chromatographic sulphonamide spots are diazotised by gaseous nitrogen oxides and detected by coupling. Difficulty is encountered with those lacking an unsubstituted aromatic amino group, but if they are also carboxylic acids they may be identified by an indicator spray. J. W. B.

Micromethods in the Paint and Lacquer Laboratory. IV—Rapid Microchemical Test for Titanium in Pigments. H. Flaschka. *Fette u. Seifen*, **53**, 544 (1951); *Chem. Abs.*, **46**, 3767 (25 April 1952).

A hot K_2SO_4 bead on Pt wire is dipped in the pigment and then reheated 0·5–1·0 min. It is then dissolved in a few drops of 1 : 10 H_2SO_4, and 1–2 drops of 3% H_2O_2 are added to the solution. Yellow to orange coloration indicates Ti. C. O. C.

Swelling Capacities of Fibres in Water. I—Desiccation Rate Measurements. L. A. Welo, H. M. Züffle, and L. Loeb. *Text. Research J.*, **22**, 254–261 (April 1952).

A desiccation rate technique for the measurement of the swelling capacity of textile fibres is described. It is essential that the rate of moisture loss be very low, and the method is only slightly more rapid than the microscopic cross-sectional method. A. B.

Swelling Capacities of Fibres in Water. II—Centrifuge Studies. L. A. Welo, H. M. Züffle, and A. W. McDonald. *Text. Research J.*, **22**, 261–273 (April 1952).

The centrifuge technique has been studied in relation to the swelling capacities of textile fibres in water. It was not found possible to obtain, in general, the true swelling capacities of fibres, but the method appears to be very suitable for detecting and measuring differences in water-holding capacity brought about by chemical treatment, etc. A. B.

Felting of Wool. H. Rath and G. Frob. *Melliand Textilber.*, **32**, 792–796 (Oct.); 872–876 (Nov. 1951).

Experimental evidence is given to show that the elastic properties of wool measured longitudinally do not always conform in a parallel manner to its ability to felt. On the other hand, if the elastic properties of wool are measured across the cross-section of the fibre together with its frictional behaviour, a good indication is obtained of its felting properties. These two measurements are combined into a single test which measures the resistance of wool to slippage and gives a reliable indication of its felting properties. B. K.

Papyrographic Separation of Polyamides and Polyurethans—II. H. Zahn and B. Wollemann. *Melliand Textilber.*, **32**, 927–928 (Dec. 1951).

An earlier paper (see *J.S.D.C.*, **67**, 356 (Sept. 1951)) describes the separation of polyamides and polyurethans by papyrographic (paperchromatographic) analysis. A method is now given for the separation of sebacic and adipic acids by this technique using a mixture of propanol, ammonia, and water. B. K.

Definition and Classification of Colours—Colorimetry and Applications. P. Mougeot and J. P. Nisderhauser. *Teintex*, **16**, 653–695 (Dec. 1951); **17**, 3–31 (Jan. 1952).

Published work on the physical classification of colours and dyes and the mathematics involved is reviewed. Colour triangles and the Munsell system are discussed. 40 references. B. K.

Use of the Grey Scale for Assessing the Effect on the Pattern in Fastness Testing. K. McLaren. *J.S.D.C.*, **68**, 205–209 (June 1952).

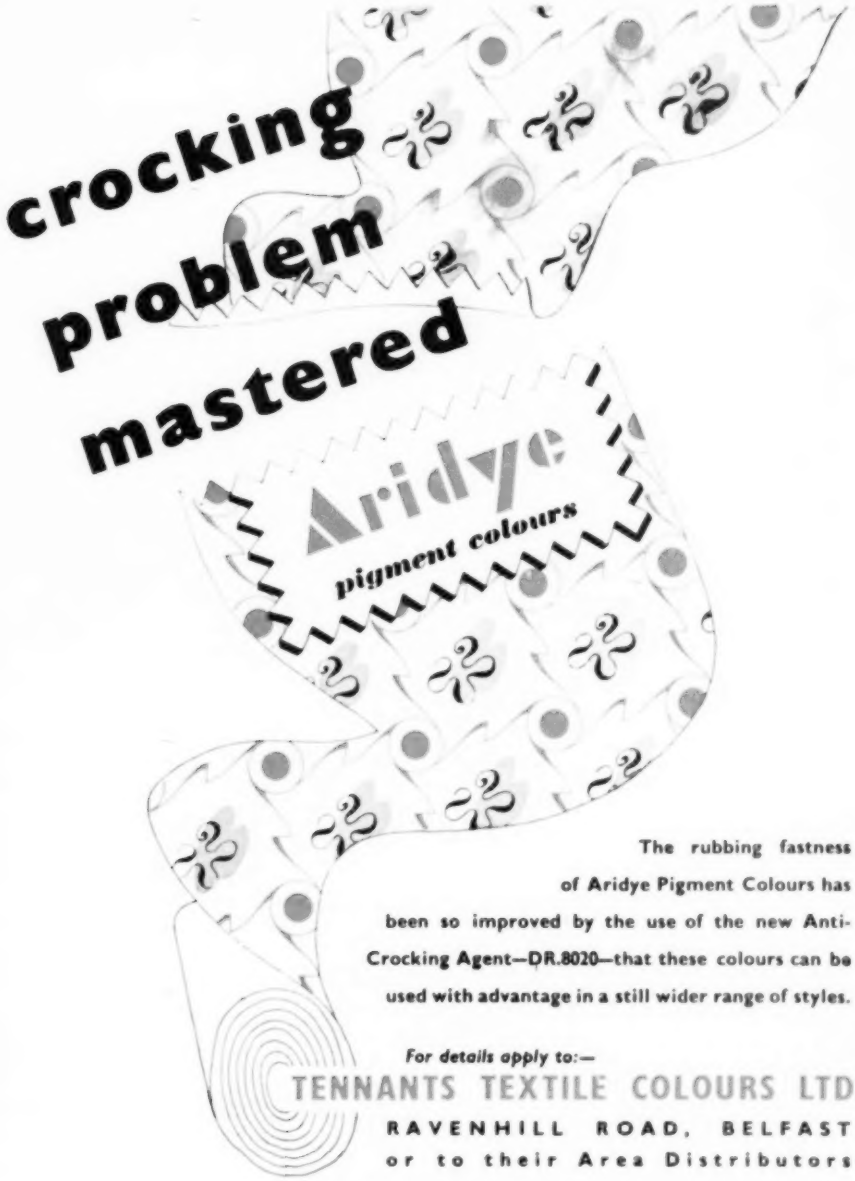
Spacing of Scales for Assessing the Effect on the Pattern in Fastness Testing. K. McLaren. *J.S.D.C.*, **68**, 203–204 (June 1952).

Method of Test for Determining the Fastness to Daylight of Coloured Textiles. Society of Dyers and Colourists Light Fastness Subcommittee. *J.S.D.C.*, **68**, 197–200 (June 1952).

Second draft revision (11 March 1952) of *B.S.* 1006.

Light Time Integrator for Use in Daylight Fading. P. H. Oliver. *J.S.D.C.*, **68**, 178–179 (May 1952).

Polarographic Reduction of Hydroxy- and Methoxy-anthraquinones (IV p. 270).
Electrical Resistance of Textile Materials—A Literature Review (VI p. 276).
Microscopic Investigation of the Milkiness of Viscose Rayon (VI p. 278).



The rubbing fastness of Aridye Pigment Colours has been so improved by the use of the new Anti-Crocking Agent—DR.8020—that these colours can be used with advantage in a still wider range of styles.

For details apply to:—

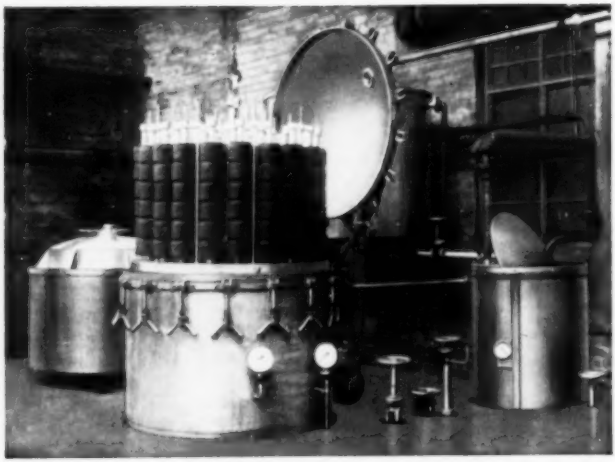
TENNANTS TEXTILE COLOURS LTD

RAVENHILL ROAD, BELFAST

or to their Area Distributors

Aridye Colours and the use thereof are protected by British Patents Nos. 522941, 523090, 524803, 552919, 561641, 561642, 631882.

TOTALLY ENCLOSED PRESSURE DYEING SYSTEM



SUITABLE FOR DYEING
CONES AND CHEESES
RAYON CAKES, WARPS & HANKS
LOOSE COTTON & STAPLE FIBRE
NARROW FABRICS

Send for Catalogue T/E 419

LONGCLOSE ENGINEERING Co LTD

BOWMAN LANE WORKS
LEEDS 10 ENGLAND

Telephone Leeds 21978-9

MEMBERS AND JUNIOR MEMBERS

Persons desirous of joining the Society as Ordinary Members or Junior Members may obtain Application Forms from the General Secretary, or from the Honorary Secretary of any Section of the Society

NEW MEMBERS

Easthope, E., 19 Kirkstall Road, Davyhulme, Urmston, Manchester

Locke, R. M., Pittsburgh Coke & Chemical Co., Pittsburgh 25, Penna, U.S.A.

Mitchell, A., Kenfore, 4 Kennedy Avenue, Fixby, Huddersfield

Straw, A. J., 30 Strathallen Drive, Baildon, near Shipley

Watson, D. A., Millmount Villa, Lurgan Road, Banbridge, Co. Down, Northern Ireland

ADDRESSES WANTED

Alexanian, V. D., formerly of 5 Commgwath Road, Carlton, Nottingham

Cabral, Joao de Oliveira, formerly of Rua Costa Cabral 596, Porto, Portugal

Evelbauer, H. L., formerly of Friedrichester 7, Marburg (16), Hessen, U.S. Zone, Germany

Josephson, C., formerly of c/o Silknit Ltd., 400 Sidney Road, Durban, South Africa

Justice, A., formerly of 35 Cumberland Avenue, Liverpool

Lowe, R., formerly of 17 Ashdown Avenue, Leicester

Marriott, F. W., formerly of 49 Woodcot Avenue, Baildon, near Shipley

Shaw, R. P., formerly of Chellow Garth, Cumberworth Road, Skelmanthorpe, Huddersfield

MEMBERS' CHANGES OF ADDRESS

Baranek, R., formerly of Mansfield Road, to 2 Chaucer Villas, Chaucer Street, Nottingham

Benson, H., formerly of 1 William Henry Street, Brighouse, to 59 Raynor Road, Brighouse, Yorks.

Biddle, G. C., formerly of Manchester, to Box 803G G.P.O., Adelaide, South Australia

Carnwell, R. T., formerly of Spondon, Derby, to 129 Parkside, Heage, Derbyshire

Dutfield, J. N., formerly of Kidderminster, to Buckfast Spinning Co. Ltd., Lower Mills, Buckfastleigh, S. Devon

Foley, B. C., formerly of Belfast, to Ballievey, Banbridge, Co. Down, N. Ireland

Groves, S. E., formerly of Evington Lane, Leicester, to "Killoran", Station Road, Thurnby, Leicester

Hancock, F. W., formerly of Prospect Avenue, to 39 High Street South, Rushden, Northamptonshire

Hardt, Z., formerly of London, to c/o Dr. K. Ripa, 2639N Kimball Avenue, Chicago 47, Ill., U.S.A.

Holland, F. S., formerly of Princess Street, to Moelfra, 116 Manchester Road, Swinton, near Manchester

Lantz, L. A., formerly of Manchester, to c/o Mr. Rynert, 109 Obergrundstrasse, Lucerne, Switzerland

Maxfield, D., formerly of Bradford, to 2 Bisley Court, Jamieson Street, Bulawayo, S. Rhodesia, S. Africa

Minta, P., formerly of Nottingham, to 902 St. Viateur, Joliette, Quebec, Canada

Oakes, T., formerly of 203 Vimy, to 24 Neptune, Strathmore, Quebec, Canada

Page, H., formerly of Collingham Bridge, to Aislaby, Scatcherd Lane, Morley, Leeds

Piesse, A. D. J., formerly of Tasmania, to c/o Bruck Mills Ltd., Wangarratta, Victoria, Australia

Unwin, H., formerly of Herts., to c/o Julius Kayser & Co. Ltd., Fountain Inn, S. Carolina, U.S.A.

Wright, I., formerly of Buckton, Belford, Northumberland, to Ford Westfield, Berwick-on-Tweed, Northumberland

CHAS. FORTH & SON
LIMITED

CHEMICALS
for Dyers & Bleachers
ACIDS ALKALIES SOAPS

DYESTUFFS
for all purposes
DYEWOOD EXTRACTS HEMATINES

NEW BASFORD
NOTTINGHAM

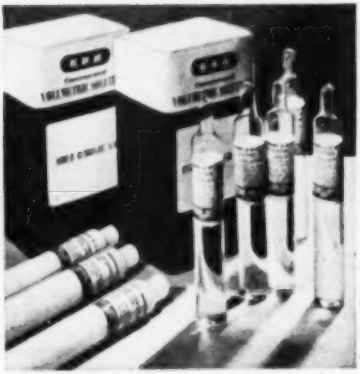
Telephones 75147—75148
Code A B C 5th Edition

Telegrams
DELTA-NOTTINGHAM

Patents — Designs — Trade Marks
W. P. THOMPSON & CO
CHARTERED PATENT AGENTS

80 LINCOLN'S INN FIELDS
LONDON WC 2
Holborn 2174

12 CHURCH STREET
LIVERPOOL 1
Royal 3172



The accuracy of solutions prepared as directed from B.D.H. Concentrated Volumetric Solutions is within the factor limits of 0.999 and 1.001.

THE BRITISH DRUG HOUSES LTD.
B.D.H. LABORATORY CHEMICALS GROUP
POOLE DORSET
Telephone: Poole 962 (Six Lines) Telegrams: Tetradome Poole

B.D.H. *Concentrated* VOLUMETRIC SOLUTIONS

Appear in a new packing

The well-known cylindrical 7-ampoule rigid carton has disappeared. B.D.H. Concentrated Volumetric Solutions are now issued in a new package of six ampoules. This gives even more security than the original container, costs less, and is more compact.

While the ampoules are unchanged, increasing production and the more economical packing enable them to be supplied at much lower prices. The new range includes a carton of solutions for the precise determination of water hardness by the Schwarzenbach method. Please ask for a copy of the price list.

C.V.S./3

AMOA CHEMICAL CO LTD

HINCKLEY LEICESTERSHIRE

EMULSIFIERS · EMULSIONS READY FOR USE
WETTING AGENTS · SIZING ASSISTANTS
SOLUBLE WAXES · SULPHATED FATTY ALCOHOLS
DULLING AGENTS · WINDING AND KNITTING OILS
DETERGENTS · SOFTENING AGENTS
SAMPLES AND LITERATURE AVAILABLE

Brilliant Avirols
(ANION ACTIVE FINISHING AGENTS)

●

FOR A PERFECT HANDLE
ON SPUN RAYON FABRICS

●

No adverse effect on dyed shades

THE GARDINOL CHEMICAL CO LTD MILNSBRIDGE HUDDERSFIELD
Telephone MILNSBRIDGE 287

SUITING THE PARTICULAR

Many of the dyestuffs for woollen and mixed-fibre fabrics are derived from the Staveley Chemicals Aniline Oil and Anthracene. Other sections of the Textile Industry processing cotton, linen, rayon and nylon also find these Staveley products together with Staveley Sodium Hypochlorite and Bleaching Powder most satisfactory in their dyehouses.

STAVELEY

BASIC CHEMICALS FOR INDUSTRY

THE STAVELEY IRON & CHEMICAL CO LTD near CHESTERFIELD

AIL

MANUTEX

the ideal thickener for textile printing pastes

A UNIFORM PRODUCT

SOLUTIONS MADE WITHOUT BOILING • SIEVING OF SOLUTIONS UNNECESSARY

EASILY WASHED OFF LEAVING SOFT HANDLE

EXCELLENT COLOUR YIELD AND PENETRATION

VISCOSITY AND FLOW CHARACTERISTICS CAN BE VARIED OVER A WIDE RANGE

Manutex can be used in most styles of printing and full technical data with formulae and samples will be sent on request

ALGINATE INDUSTRIES

LIMITED

Walter House, Bedford Street, Strand, London, W.C.2

TELEPHONE: TEMPLE BAR 0451

EDGES

Bleachers Specialities

AS USED IN THE PRINCIPAL BLEACHERIES OF THE WORLD

SHADING BLUES · CLOTH SOFTENERS

CLOTH FILLERS · CLOTH GLAZES

MOVOL — *Stain Remover*

Send for Samples and Prices to Manufacturers

60 YEARS' REPUTATION

Wm EDGE & SONS LTD BOLTON

JN. 614

Telephone Dudley Hill 253 & 254 (Private Branch Exchange) Telegrams BISULPHITE BRADFORD

J B WILKINSON (CHEMICALS) LTD

Manufacturers of

SODIUM HYDROSULPHITE POWDER and CHEMICALS

FOR DYERS BLEACHERS PRINTERS and all Branches of the Textile Industry

DUDLEY HILL CHEMICAL WORKS BRADFORD

Highly Efficient Wetting-out Agents of Unsurpassed Strength

ORANITS:-

BN

For Wetting-out Cotton and other Vegetable Fibres. Dissolving Substantive, Sulphur and Vat Dyestuffs for Dyeing and Printing

FWN

For Wetting-out and Dyeing Woollen Materials, Dissolving Acid and Chrome Dyestuffs

KSN

For increasing the Penetration of Carbonising Liquors. Dyeing of Carbonised Goods

C NEW

For Dissolving Basic and Modern Chrome Colours for Dyeing and Printing

THE HEXORAN CO LTD

UNITY WORKS BELPER DERBYSHIRE

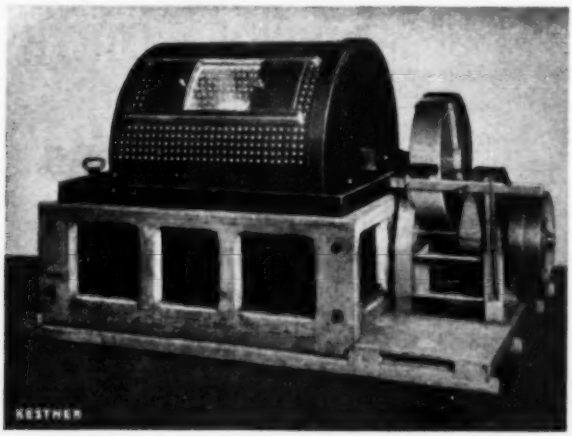
Telephone **Belper 471** *Telegrams* **PROGRESS BELPER**

AGENTS

LONDON & MIDLANDS—Shaw & Harrison Ltd. 2 Finchley Court, Ballards Lane, Finchley, N.3.
SCOTLAND—Mr C. Stewart, "Nihsmbi", Bearsden, Dumbartonshire
IRELAND—Alfred Cotter, 7 Corporation Square, Belfast
NEW ZEALAND—S. W. Peterson & Co. Ltd. 165 Vivian Street, Wellington
AUSTRALIA—Vance & McKee Pty. Ltd. 235 Claronca Street, Sydney
Vance & McKee Pty. Ltd. 40 William Street, Melbourne
INDIA—George Wills & Sons Ltd. England.
Distributors—Nagindas Kilabhai & Co. Lalgir Chambers, Tamarind Lane, Bombay. Branches—Ahmedabad, Cawnpore, Calcutta, Coimbatore, etc

★ *A new type of*

DYEING MACHINE



KEEBUSH is the most effective material for the construction of modern dyeing machinery. KEEBUSH is supreme because it is non-metallic, impervious to corrosives, light in weight, non-absorbent, and unaffected by temperature up to 130° C.

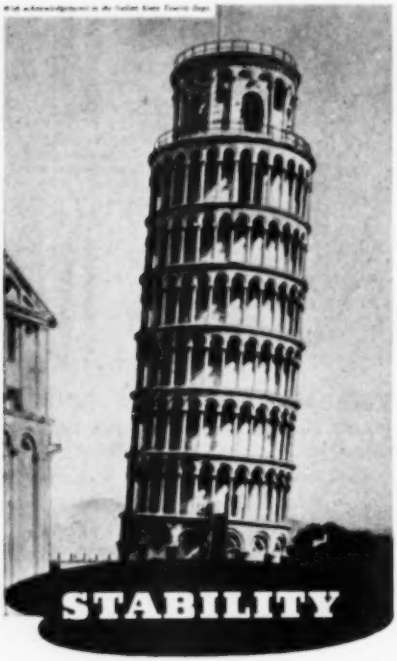
KESTNER'S specialise in the manufacture of first-class Dyeing Plant made in KEEBUSH. They also supply Dyeing Machines, Dyeing Drums, Steam Injectors, Dyeing Vats, Rollers, Pumps, etc—all made in KEEBUSH.

KESTNER'S

Chemical Engineers

KEEBUSH

KESTNER EVAPORATOR & ENGINEERING CO LTD 5 GROSVENOR GARDENS LONDON SW1



The 179 feet high Leaning Tower of Pisa is 16½ feet out of the perpendicular yet it still retains its stability.

Hydrogen Peroxide is a stable chemical. It is the safest and most reliable bleaching agent for all fibres. An excellent standard of whiteness is ensured and the risk of tendering is reduced. Our Sales Service and Development Department will be pleased to advise you on your bleaching problems.

HYDROGEN PEROXIDE BY

LAPORTE

LAPORTE CHEMICALS LTD., LUTON

Telephone: Luton 4390 Telegrams: Laporte Luton

TETRALENE
Detergent and solvent for washing and scouring of textile materials, for use with alkaline or soap solutions

ESTRALENE
Sulphonated Fatty Alcohols in Paste Powder and Liquid

ESTROL
Very efficient wetting and dispersing agent

RETARDOL
For level dyeing of vat colours on rayon etc

FURTHER INFORMATION AND LITERATURE ON REQUEST

Manufacturers of
TEXTILE AUXILIARY CHEMICALS

STOCKPORT UNITED CHEMICAL CO LTD
BUXTON ROAD WORKS STOCKPORT

Telephone Great Moor 2980 Telegrams TETRALENE STOCKPORT

BROWN & FORTH
LIMITED
FOUNDED 1890

DYESTUFFS

•

SODIUM CHLORITE
AND ALL
CHEMICALS
FOR TEXTILES

83-117 EUSTON ROAD 118 CHORLTON ROAD
LONDON NW1 **MANCHESTER 15**
EUS 5181-5 MOS 1347-8

AND AT NEW YORK

HATHERNWARE

CHEMICAL STONEWARE

For safely handling ACIDS

BLEACH & DYE

LIQUORS

FUMES etc

In the Laboratory or on full-scale production, wherever corrosive agents are made or handled, Chemical Stoneware and Porcelain ensure freedom from corrosion of Plant or contamination of product. Without obligation, our Technical Department will gladly advise on Plant corrosion problems.

Write for illustrated list

HATHERNWARE LTD

Dept. SD · LOUGHBOROUGH

Telephone **Hathern 273** **England**

COLNE VALE

DYE & CHEMICAL CO. LTD.

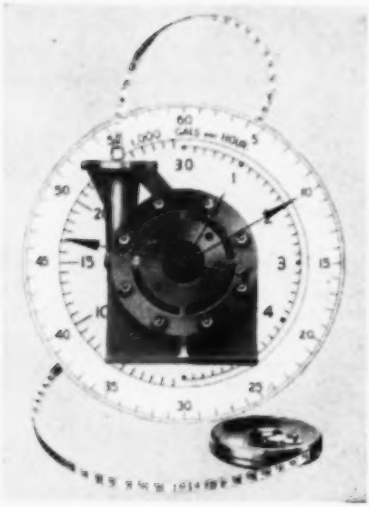
MANUFACTURERS OF

BISMARCK BROWN R and Y Conc. and Base	NIGROSINE (Spirit Soluble)	WATER BLUE R Conc.
PURE CHRYSOIDINE Y D and R D and Base	NIGROSINE BASE	INE BLUE N and B N
INDULINE (Water Soluble)	BASIC MAGENTA	INE BLUE SPECIAL
INDULINE (Spirit Soluble)	ROSANILINE BASE	SPIRIT BLUE
INDULINE BASE	ACID MAGENTA Conc.	INDIGO CARMINE C V Ex.
NIGROSINE (Water Soluble)	PURE SOL. BLUE 1 Conc.	LAUNDRY BLUES
	PURE SOL. BLUE 3 B Conc.	METACHROME MORDANT
	SOLUBLE BLUE Conc.	

Also full range of ACID, BASIC, DIRECT and CHROME COLOURS

Samples and Prices will be forwarded on application

TELEGRAMS ANILINE, HUDDERSFIELD **MILNSBRIDGE, HUDDERSFIELD.** TELEPHONE 3 MILNSBRIDGE



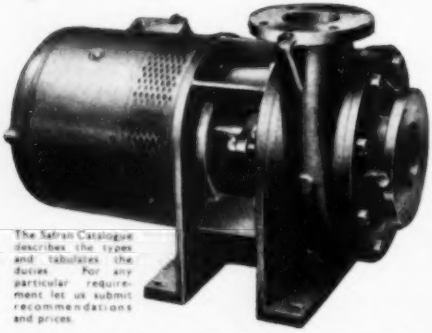
After you have received your

SAFRAN

REGISTERED TRADE MARK

CENTRIFUGAL PUMPS

the good delivery goes on.



The Safran Catalogue describes the types and tabulates the duties. For any particular requirement let us submit recommendations and prices.

SAUNDERS VALVE CO LTD

Safran Pump Division

CWMBRAN MONMOUTHSHIRE ENGLAND

Packed in special flexible writing tubes or in tins.

Supplied in Yellow, Black, Red or Blue

For marking all textile piece goods

Successfully withstands Bleaching, Dyeing and Finishing Processes. Dries rapidly and does not "mark-off".

Send for leaflet SY208

GLAZEBROOKS LIMITED

TYSELEY, BIRMINGHAM 11

The most powerful and stable SEQUESTERING AGENT

NERVANAID B

★

Renders inactive the ions of Calcium, Magnesium, Aluminium, Iron and Copper. Invaluable in textile processing and many other industries

★

Samples and details from the manufacturers

NORMAN EVANS & RAIS

LIMITED

DUDLEY ROAD, MANCHESTER 16

Telephone Moss Side 2277

Telegrams CHRIEVAN MANCHESTER

Aniline & Alizarine Colours

Solvents & Chemicals

We solicit your inquiries for Aniline and Alizarine Colours and Chemicals and shall be pleased to forward samples and prices on application

• **HYDROGEN PEROXIDE**

(CONCENTRATED)

Free from all impurities Prompt deliveries from stock

COLE & WILSON LTD

24 GREENHEAD ROAD HUDDERSFIELD

Telephone Huddersfield 1993 *Telegrams* COLOUR HUDDERSFIELD

WORKS — Common Road Hey Hall Birkby Huddersfield *Telephone* Huddersfield 2499

ESTABLISHED 1877

We have been Manufacturing

DYESTUFFS

for more than Seventy Years!

Why not avail yourself of our long experience? It is freely at your disposal.

Williams HOUNSLOW *Ltd.*

HOUNSLOW WH LA MIDDLESEX

IMPORTERS FROM GERMANY

of

Naphtols Bases Salts
Rapid-Fast-Colours
Rapidogens Rapidazols etc
Stable Solubilized Vat Range
Vat Dyestuffs Pigments etc

AUXILIARIES

FULL PARTICULARS FROM

BERNARD KEEGAN LIMITED

164 GARNETT STREET BRADFORD

Telephone 26717 (3 *lines*) *Telegrams* CHEMDYE BRADFORD

Quality Dyes and Products

L·B·H & Co Ltd

Have **YOU** *had samples of the recent additions to our ranges of products?*

Monochrome Flavine R
Superlan Astrol B
Paradone Brilliant Orange GR New Double Paste

If not, contact Sales Department—

L B HOLLIDAY & Co LTD HUDDERSFIELD

Notice to Authors of Papers

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor, Society of Dyers and Colourists, 19 Piccadilly, Bradford. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion at the beginning of the paper. References to the literature should be numbered consecutively, using superscript numbers without brackets immediately following the text words or author's name to which they refer.

The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the Index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Jan. 1950 issue (p. 54) should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

Twenty-five free copies of a reprint are supplied to the author of an original paper published in the *Journal*, or fifty free copies are supplied when there are two or more authors, and a further number may be purchased from the Society at the rates given below.

REPRINTS OF LECTURES AND COMMUNICATIONS

Reprints of all lectures and communications are available after publication to members and non-members of the Society. The charges (postage included) are as follows— Single copies 2s. 6d. each; per dozen copies up to and including 8 pages, 12s. 6d., and for papers occupying more than 8 pages of the *Journal*, 17s. Orders should be addressed to "The Society of Dyers and Colourists, 19 Piccadilly, Bradford". They can be accepted only if accompanied by remittance and if received immediately after publication of the paper.

THIES

PRESSURE DYEING AND BLEACHING

A universal dyeing and bleaching apparatus to take cones, cheeses, beams, loose material or card sliver.

QUICK DELIVERY GIVEN

QUICK DRYING

Drying apparatus to give controlled drying in up to 1½ hours.

ECONOMIC PRODUCTION BY LABOUR-SAVING MACHINERY

B. THIES

Represented by

JOHN GODRICH 22 Bennett's Hill BIRMINGHAM 2

PUBLISHED FOR THE SOCIETY AND PRINTED BY CHORLEY AND PICKERSGILL LTD LEEDS
ENTERED AT THE NEW YORK POST OFFICE AS SECOND CLASS MATTER